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H. L. C. HALL

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# MANUFACTURING COST

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The writer does not
think for a moment that
this little book is the last
word on the subject, nor does he
wish to assume a dogmatic attitude in
presenting the views expressed. The
conclusions drawn to present some facts and
purpose has been from his own experience. If his
efforts shall succeed in throwing any additional light
on a subject which is a most important one,
or in rendering it possible to dispense with
a certain amount of experiment hitherto
unnecessary, his aim will have been
accomplished. To all those who,
being interested in the subject,
are willing to overlook its
many manifest faults

THIS BOOK
IS
RESPECTFULLY DEDICATED
BY
THE AUTHOR

M700975

## PREFACE.

HERETOFORE all expositions of cost systems have merely been detailed accounts of certain systems in use by certain more or less successful manufacturing institutions. While these expositions of existing systems are of value they are not of much particular value to the seeker after information on other lines than those dealt with in the illustration, for they deal with abstract cases instead of principles. A man who is seeking to establish a cost system for an iron working establishment will naturally be interested in reading the cost system used by some other similar institution, but if on the contrary he is seeking for a cost system in a wood working shop, the information given regarding the iron working establishment will be of neither interest nor value to him. In this work the subject will be dealt with along general lines and not from the standpoint of any particular industry.

# MANUFACTURING COST

## SECTION I.

### Why should an accurate record of actual costs be kept?

A LEADING manufacturer said to the writer not long since, "Why should I spend time and money in keeping a record of my costs? Cost in my case has nothing to do with the selling price, that is, the price I can obtain for my product." This remark shows the position taken by many manufacturers who do business on the false principle that so long as they have money they have made money. In other words the old saying, "Pocket empty—Cash Balanced." The writer does not for a moment maintain that the sole end, or even the chief end of a cost system is to serve as a basis for price making. Prices are governed by a hundred considerations all more or less remote from the question of cost.

The first and greatest element which enters into the making of prices is, of course, the question of supply and demand, and while it naturally follows that a manufacturer will soon cease to produce a supply of an article if there is no demand at a profit, circumstances may be such that someone can provide that article, selling it at a price which will yield them a profit, but would net him a loss. The story of modern trade and manufacture is a story of continued progress, particularly in this country, and no small portion of this progress is due to the possibility

of economical production. Economical production is the result of close analysis of conditions surrounding the trade or manufacture in question with consequent improvement of weak spots as soon as they are discovered. There was a time when the factory was a one man affair. A single workman often performed every operation in the process of manufacture. As trade increased another workman, possibly, was taken on, but he, like the former, was complete in himself, requiring no assistance to produce the completed article. After a time some industrial genius saw that the process could be shortened by dividing the labor, and as a consequence of the shortening of the process the cost of production was decreased. This division of labor provided that one man would perform one part of an operation, a second man performing the other part, both men being necessary to the production of the complete article. This division of labor naturally produces, in time, a workman who is more expert along certain lines or in a certain part of the operation than in any other part, and as his expertness increases, his productive capacity naturally increases at the same time.

The fact that this subdivision of labor produced better results than the old system of individual production was, of course, soon observed. Analysis of the situation showed these earlier manufacturers why it was that cost of production was reduced by the operation of this plan, and the tendency to still further subdivide and specialize labor was increased with great rapidity until at this time it very frequently occurs that a process of manufacture embodying twenty or more separate operations employs a separate workman to perform each operation.

A notable instance of this tendency can be seen in

any moderate sized packing house. In the smaller institutions of this character one man might perhaps be able to kill and dress we will say for instance 20 hogs a day, while a gang of 40 men operating on the principle above mentioned would kill possibly 4,000, an enormous increase as will readily be seen in the average individual output. So long as the output was small, it was an easy thing for the manufacturer to analyze the conditions surrounding production without any particular system of record, but presently as labor was more thoroughly specialized and operations multiplied the need of some system which would allow comparison of records of production was clearly seen. The manufacturer asked himself these questions with regard to his product.

What is the total cost?

How is this cost divided?

How much is the waste?

In order to answer these questions a crude system of cost finding was evolved, good as far as it went, but not of very wide scope. Estimates and guess work instead of fact was used for the figures produced, and as a consequence the result obtained was far from being satisfactory, although it was a long stride in the way of improvement.

Just what this specialization means is shown by some exact figures from the census reports with reference to the—so called—trusts. The reports show that the average industries of this country show a labor cost of 18.86 per cent of the value of the product. Of these, 183 trusts or combinations taken as a whole show that their labor cost is only 11.71 per cent of the total value. The average output of each employe is $2,451 according to this

same report. The average output for each employe in the combinations or trusts above mentioned was $4,161. This is very clearly an evidence of the immense economies made possible by thorough organization and this is only a part of the story. The waste which prevails under ordinary circumstances is reduced to just as great an extent as the economy is increased. No statement is made as to the average profits of the various industries at large or of these combinations, but there is no question but that they will show the same wide difference as in cost and production as above noted.

These combinations succeed in producing the results here noted through the operation of a system of records which enable them to compare each day's or week's performance with the performance of the day or week previous. Constant observation and a study of these comparative records naturally shows every little detail and enables the management to introduce economies small in themselves yet large in the aggregate. An accurate cost system with records of past performances is invaluable. When it comes to a question of future work such a record is indispensable. In seeking for an outlet for a manufactured product it is very frequently necessary to bid on work for future delivery. When this is necessary the manufacturer must ask himself what *will* it cost not what *did* it cost? As Patrick Henry said: "Mankind has no way of judging of the future but by the past," and given an accurate and complete record of past performances along any definite lines it is usually safe to assume that future performances can be carried out at the same cost, or possibly less, always providing that the cost of labor and the prices of raw material are the same. If at any

time the cost of a certain operation, that is, the labor and expense cost of that operation, should rise above the record of past performances it is at once apparent that there is a weakness somewhere in the organization, possibly improper execution of the plans of the management. The exact place where this weakness lies will be easily located if the cost system is what it should be. It very frequently chances that a producer can either through lack of competition, superior excellence of product, nearness to his market or some similar cause, obtain a price which is out of proportion to the cost. At other times just the contrary is the case. A producer finds that in order to keep his plant running he must accept orders at a very low figure. When this latter is the case it becomes merely a question of policy on the part of the producer as to just how far he should go in the reduction of his price. If his cost system is accurate he will simply be called upon to decide as to just how much loss he is prepared to accept in order to get business and keep his plant running, and it will very easily be seen that it is a dangerous thing to accept losses of this kind without knowing with absolute certainty just what that loss is. If the manufacturer accepts a loss with an absolute certainty as to its extent, it is a matter of business, but if he goes into a thing blindfolded accepting a loss whose magnitude he cannot estimate, he is simply tempting fate, because it becomes then a gamble instead of a business proposition. Every manufacturer will, of course, remember in considering a question of the character above noted, that a plant which is not in operation is still subject to a large portion of the general and plant expense to which it is subject when in full operation. In addition to this the

deterioration of a plant is much more rapid when in idleness than when in use, and, therefore, it is very frequently good business policy to accept orders at a price which will yield absolutely no returns in the way of profit rather than to discontinue operations. The writer has in mind a manufacturing institution now very successful and paying large dividends, which ran for two years at a positive loss merely in order that it might keep together its corps of trained assistants and skilled workmen, which would naturally have become scattered and hard to regain had the plant been shut down.

A cost system is useful even though it be incomplete. It teaches something although it may not teach all it should. In order to fill its entire field of usefulness it must cover every detail of expense, for all cost is an expense of one sort or another. Every five cent piece spent in a manufacturing business is a part of the cost, and it is the function of a cost system to determine just where each individual expenditure should be applied.

The installation of a cost system sometimes brings to light some totally unexpected facts. Investigation sometimes shows that a factory is making a profit on one portion of its production while it is losing on another portion. It is usually discovered that the discrepancy is entirely a question of shop management. As above stated, the prices are very largely out of control, but the cost of production is not. Here lies the vital function of a cost system. In this day of close scrutiny of output and fierce competition of price it is important that no stone be left unturned in the effort to increase the proportion of production to cost.

A few years since a well known, long established and

successful manufacturing concern was confronted with the fact that a younger and seemingly less powerful concern was taking away their best trade by underselling them even in their own field. This was an intolerable condition of things and an executive council was held to consider the situation. A careful consideration of the situation and a careful examination of all the data at hand brought forth the fact that to meet the competing prices would result in at least a surrender of all profit—perhaps an actual loss. Sources of supply were carefully watched, and it was found that raw material and labor "per hour" was costing each concern the same—where then could lie the advantage which made it possible for the younger concern to undersell the elder? The head of the old concern had steadily refused to spend a penny in what he called "new fangled notions." Time clocks, time stamps, cost accounts, stock records and all the newer means of making records were "fads" to him—and nothing more. An annual inventory with the balance on the right side of the books was, he contended, a "good enough system." In the crisis here to be met he at last consented to the installation of a cost system. An expert was called in, spending some little time in investigation. The old manufacturer was actually appalled when the report came in for it showed an actual waste of over 20 per cent—and all unnecessary waste at that. Reforms were promptly instituted, of course. New systems were adopted. The crisis was met and passed, and this brings me to my point. To reform an abuse you must first point out just what the "weak spot" is—"First catch your hare."

Show just where the leak occurs. It is one thing to say "There is something wrong." It is another thing to say "here is the fault."

The manufacturer whose plant is so small and whose employes are so few that every item can be kept under his own eye and every fact be recorded in his own memory might be able to locate approximately any undue waste or any unwarranted expense occurring in his plant, but even he could do this only approximately—not accurately enough to allow his estimate to be of real value.

In the average factory of modern times, employing dozens, perhaps, thousands, of men, the mass of intricate detail is so great that it is beyond the power of even the heads of departments to grasp the details of their own departments without a system of reports which will tabulate for them the results in their own departments. These reports must present a comprehensive view of all of the smaller details for it is usually the case that the waste and leakage—if there be any—is in the small items which are so easily overlooked or underestimated.

The whole question is: How to put the whole detail in easily comprehended form before the management so that no necessary information be omitted and no unnecessary and confusing detail be included.

To accomplish this end it will be necessary to make, so far as possible, each separate operation complete in itself so far as its records are concerned. When this is done each of the various steps in a continuous process can be examined one by one and each one by the man most thoroughly qualified to pass upon the question of a possible reform, a possible simplifying and consequent cheapening of the operation under inspection.

Just what amount of detail is necessary and advisable in presenting these detailed records must be determined by each user for themselves. A system which

would be ample as to minuteness of detail for one concern would be too brief and "sketchy" for another, and possibly too complex and diffuse for a third. Your system must be made to fit your own needs and your own needs alone. The cost accountant of what is said to be the largest stove works in the world stated to the writer in a conversation, that even another works of approximate magnitude and exactly the same line of manufacture, would find it absolutely impossible to adopt, bodily, the system used by him owing to differences in process and administration, hence general information on the subject should always be largely outline instead of detail.

## SECTION II.

### Organization.

WHILE it is extremely probable that most of the readers of these lines will be operating under a fully equipped organization, a word or two on the subject may not be amiss here.

A modern factory should be perfectly co-ordinated. Each factor in the organization should have its own place. Each man should have his own orbit—and swing within that orbit only. It is surprising to note the seeming lack of organization which prevails in some successful institutions, but in most of them it will be found that the success they have attained has been in *spite* of the lack and not *because* of it.

The most clearly apparent drawback caused by poor organization is a conflict of authority and a duplication of work—both serious defects. To overlap or duplicate certain duties is productive of evil in two ways—first, because it is a waste, and second, because it takes away what should be a sole responsibility. When two people are effectually concerned in getting something done it is usually necessary to provide a third to see that they do it. Give it to one man to do and he will usually take a personal pride in seeing that it is done—and well done. This is peculiarly the case in particular instances where it in-

volves delegated authority. There is little incentive to do a piece of work particularly well when you know that someone else will share the credit—perhaps unjustly. It is all very well to talk of work well done being its own reward—careful inquiry will show that it is always well to offer some other reward as well in the way of credit and commendation.

Many institutions are adopting the so-called pyramid plan of organization. In this plan the work to be done is thoroughly departmentized and each department head made responsible only to his immediate superior. We will suppose for the sake of illustration that the executive head of the concern is a general manager, responsible only to the board of directors. Reporting to him are superintendents and to them in turn department heads, etc., as suggested in the sketch shown on page 18.

This also involves the committee plan of management which gives a voice to every man who is made responsible (even in the smallest degree) for the execution of any plan. This committee plan starts with the organization of a committee in the shop called the "shop committee." This committee is composed of the foreman and one or two of the most intelligent and interested workmen under him—sub-foremen or "straw bosses" as they are sometimes called. Very frequent meetings are unnecessary as they will not discuss orders, of course, but merely plans having their origin in their own department or shop. Each shop is to be provided with a receptacle for suggestions and complaints, and at certain stated times these are taken up and considered by the "shop committee."

It is a demonstrated fact that is well known to all

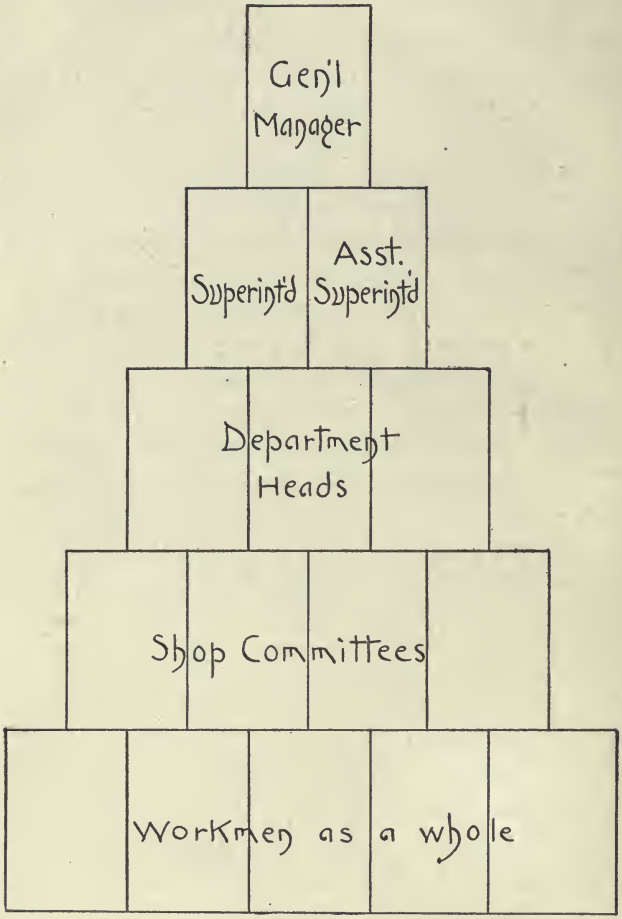
Gen'l Manager
Superint'd
Asst. Superint'd
Department Heads
Shop Committees
Workmen as a whole

FIGURE 1

who have come into immediate contact with the understratum of employes (sub-foremen and workmen) that they are always timid about making complaints or suggestions to those much above them in authority. Possibly they fear to be thought meddlesome—possibly they think that those above them should "know it all." Be that as it may, they will discuss among themselves abuses and improvements in a way which would surprise their superiors if they could hear them.

Suggestion and criticism of this sort is valuable when it can be gotten. Valuable first for what it may really be worth, and second, for the effect the making of them has upon the workman himself. It is not to be supposed that the executive head of the concern can take time to listen in person to all of this, much of which is of no real value, hence the "shop committee" sifts out the chaff from the wheat and passes the latter on up with its recommendation as to disposal.

The next step is a board to whom all this may then be referred. This board or committee is composed of heads of departments, meeting together at stated times for the purpose of taking concerted action upon such matters as may be reported to them, and for the purpose of discussing any subject or plan brought up by a member. This committee puts into concise shape any subject it may make a decision upon in order that the subject in question may be presented to the executive head in a form which will waste as little as possible of his time.

The great advantage of this committee plan is the time saved. Ordinarily a plan is submitted to the "head" and by him finally approved or disapproved. If the former, it must be submitted to the other people concerned,

and by them amended to suit their ideas. Sometimes this process is gone through with three or four times, and all this takes time. When the plan—whatever it may be, is submitted in open meeting, it is at once subject to the scrutiny of each one concerned. Objections are voiced, amendments made, and when it is finally passed upon it is in such shape that it needs only official action to put it into effect.

It is natural, perhaps desirable, that each department manager should see all things with an eye single to the interest of his department. Suppose the sales manager proposes some action looking toward the greater ease of selling the product. The head of the manufacturing department objects because it will increase his cost. Then will follow the weighing of "pro and con" until a basis of mutual interest is reached.

All this leads to the development of individuality and initiative. An employer of labor of any grade is doing himself an injustice when he neglects to take advantage of the ideas of his men—one of two things happens in every case; either the man goes somewhere where he can expand or he withers and loses his ideas. In either case the employer loses.

Next to good pay there is nothing so conducive to the contentment of the average workman as good treatment. Many concerns have apparently found it a paying investment to spend much money in improvements, sanitary and otherwise. Although a legitimate part of the subject this question can find no extended discussion here. Suffice it to say that absolute unity of purpose and concert of action is an absolute necessity to the largest measure of success no matter how that end may be attained.

Old time plans of organization are too apt to place the bulk of responsibility upon one man to the great detriment of the general health of the business. Perhaps this detrimental effect was not noticeable because the concern was successful—that proves nothing. It might very possible have been much more successful had the leading mind been allowed to forsake details and expand in the manner which the proper organization would have permitted.

In an organization which imposes unnecessary detail upon one man or one set of men there is injustice to those men. Too close application to unnecessary detail means a cramped mind and broken down health.

## SECTION III.

### Books, Loose Leaf and Bound, Cards and Slip Records.

THERE is much prejudice in the minds of some people against substituting card or loose sheet records for the old style bound book. In some cases the desire to preserve all records indefinitely has become a mania. Many years accumulation of useless records are often stored away with the statement that "we may need 'em some time." It will be hard to convince one with this mania that there is any merit in cards or loose sheets so we will not try.

When considering card and loose leaf systems it is well to remember that, like every other good thing it is possible to overdo their use, their advocates have fads also and many of them refuse to admit that there is any place where a card cannot be used to the best advantage. The truth is that each has its merits and the wise user will combine all three.

The records shown in these pages will usually be shown in the shape of cards because that seems to the writer to be the best and most economical means of recording all items which do not require a great amount of space. Loose sheet forms are used where many entries are to be made on one sheet.

One great advantage of these records over book rec-

ords is the fact that time is saved in various ways by their use. In using books to transmit orders economy usually suggests that two or more orders be entered in one book. This occasions delay as both or all the orders on one book must be filled before any of them are sent forward to the next handler. It is possible to index and cross index cards with little trouble with a degree of thoroughness which is possible in the case of bound books only with the outlay of much time and trouble.

With cards and loose leaves it is possible to make duplicate entries at one operation to an extent which is impossible under any circumstances with the use of bound books.

It should, perhaps, be explained just here that "cards" does not necessarily mean actual pieces of card board. In some cases slips of stiff ledger paper may be substituted and in others cheaper and thinner paper will serve as well.

Wherever paper can be substituted for cardboard it is well to use it on account of the resultant economy both of cost and space. A single card takes up as much space in a file as three or four slips of paper.

It is unnecessary to enter at length here into the details of card filing and card indexing methods. Any manufacturer of card systems will be glad to give details as to methods, cost, etc., upon request and reference to the advertising pages of The Book-Keeper and Business Man's Magazine will show the addresses of the leading houses in that line.

By the use of a properly adopted typewriter it is frequently possible to so arrange certain forms that order and duplicate or shop-order and work tickets be made out at one time, thus making considerable saving. This is not possible with books and book records.

## SECTION IV.

### Cost Accounts and General Accounts.

A COST system's functions end normally where the system of general accounts begins and it is not at all necessary for a cost accountant to have a detailed knowledge of financial accounts in general or of the financial accounts of his concern in particular. A manufacturer asks—in theory at least—of his cost accountant: What were the following costs on this article:

Labor cost,
Material cost,
Cost of supplies.

Answer these questions accurately and I will add the other items, viz:

Maintenance,
Selling cost,
Fixed charges,
General expense.

Of course it will be found advisable to put the whole detail in charge of one man in many instances—perhaps in most instances—but in theory they are entirely separable. The apportionment of expense is a question involving many nice points—in fact it involves many points which are the subject of controversy among cost accountants.

A full and detailed argument as to expense apportionment will be given hereafter.

Naturally it is necessary for the whole concern to work in harmony if the best results are to be assured but it is quite possible that we might have in our concern, a first class cost clerk and a mighty poor book-keeper. This would give unsatisfactory results because, while it would be accurately known just what the material, labor and supply cost on a given unit amounted to, the further cost (that is, expense, etc.) would very possibly be a mere conjecture or at best an "estimate." Just where a division between cost and general accounting must be made is a question. The one concerned in keeping down the actual cost is generally the factory superintendent and he has a right to limit his responsibility to those items over which he exercises control. We will say for instance that he is given a record as to previous cost per unit and told to go on with the production of that unit at a cost of $1.00 or less, raw material being the same. As he proceeds with the manufacture he finds that he can keep well within the limit. Presently he is called into the office to a meeting with the other department heads. Imagine his surprise when he is told that profits are less than the previous month in spite of his reduced cost. He knows what his cost is, and consequently disclaims all responsibility for reduced profits. He thus puts it "up to" the other parties—the sales manager and office manager. They must explain why the conditions exist and if their system is perfect they can do so, showing a legitimate increase of expense if possible or "finding the leak" if there is one.

SELLING.

Many factors enter into the making of prices, cost

being but one among the many. As a usual thing any article of manufacture must be sold at a profit because the making of a profit is the sole end and aim of the modern shop or factory and if profit cannot be shown the factory must, in the end, cease to exist.

There are times, naturally, when orders must be taken even though at a loss but this is done only that future orders may be gained, which will in the end yield a profit on the whole transaction. Sometimes it may seem policy to take orders at a small gain or perhaps none at all in order to keep up production and keep down the relative cost. This is a question of policy as before stated and its relation to the added expense will be considered later. Sometimes it is necessary to accept orders at an actual loss in order that the present force of trained workmen may be kept at hand for operations which are anticipated later and which are expected to yield a profit which will compensate for present loss.

At least a part of the present loss is a direct item of cost in making the future sale and this to a consideration of the proper disposition of selling expense.

Under almost all circumstances selling expense should be considered as a thing apart from any cost or expense incurred during manufacture or preparation for sale. More expense is encountered in selling one article than another and this expense may perhaps be utterly disproportionate to the cost. All the cost of preparing an article for shipment should be borne by the selling cost and in order that this may be shown in such a way as to be charged where it belongs it is well to divide sales territory into portions showing the cost of selling in each portion separately.

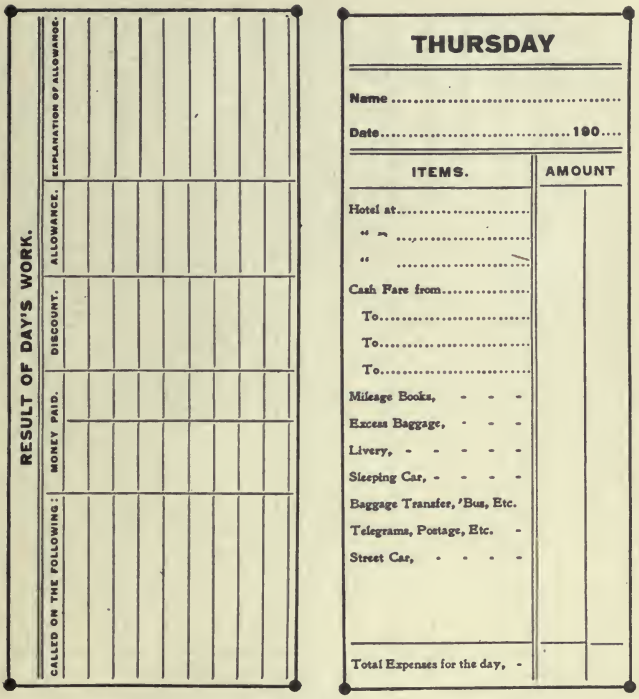


FIGURE 2

Articles sent to one part must often have special treatment in the way of packing, crating, etc., which is not necessary elsewhere and a record which will show comparative cost of selling in various localities will be a valuable one. When it is shown that sales can be made in a certain territory at a much better margin of profit than in a certain other territory it is natural that extra efforts be made to increase sales in that particular part even at a slightly increased expense.

When salesmen are employed as a medium for mak-

## Salesman's Exhibit

Salesman _____ From _____ to _____

| Month | Sales | Profit | Expense | Net Profit | % | % to Last Yrs. | |
|---|---|---|---|---|---|---|---|
| January | | | | | | | |
| February | | | | | | | |
| March | | | | | | | |
| April | | | | | | | |
| May | | | | | | | |
| June | | | | | | | |
| July | | | | | | | |
| August | | | | | | | |
| September | | | | | | | |
| October | | | | | | | |
| November | | | | | | | |
| December | | | | | | | |
| Totals | | | | | | | |

FIGURE 3

ORDER REGISTER.

From _____ to _____

| No. | Names | House | A | B | C | D | E | F | G | H | Cost | Net Profit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | | | | | | | | | | | | |
| 102 | | | | | | | | | | | | |
| 103 | | | | | | | | | | | | |
| 104 | | | | | | | | | | | | |
| 105 | | | | | | | | | | | | |
| 106 | | | | | | | | | | | | |
| 107 | | | | | | | | | | | | |
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FIGURE 4

ing sales, it is a sufficient division to open an account with each man, crediting him with a salary and commission (if commission is allowed) and also crediting allowed expenses. An expense should be kept in uniform style which when audited and approved becomes a voucher for entry on the books. Such an expense book—The Beach, is shown in Fig. 2.

Of course a charge is made against the account for all moneys paid either on salary or expense account.

At convenient times an exhibit will be made of the result of each salesman's work for purposes of comparison and a form for the purpose is shown in Fig. 3.

It is usually customary to keep a detailed record of all orders received especially if a number of salesmen are employed. A sample form as used in a leading factory making small machines is shown in Fig. 4.

In this form each order is given a number as soon as accepted and this number follows the order where it is necessary to refer to it. All orders received which are not directly due to the efforts of a salesman are entered in the first or "House" column. The following columns are allotted to the various salesmen employed and of course the sheet can be extended to accommodate as many columns as desired. In the establishment referred to the cost is entered on the sheet as is also the profit, thus showing not only the sales made by each man but the effectiveness of such sales in the way of profit production.

In actual use this sheet could be made to accommodate 30 to 50 orders and is preferably a perforated sheet for use in a loose leaf binder as that allows the sheets to be taken out and put in a file as soon as the month's orders are complete.

## SECTION V.

### Cost Systems and Cost Finding.

IN cost finding we deal always with three items, viz: Raw Material, Labor, Expense. It is argued by some manufacturers who do no merchandising outside of own manufactured product that this division is entirely an imaginary one. They hold that every cent of expenditure on the part of a factory which has nothing for sale in the form in which it is purchased constitutes an expense item. Be that as it may it is necessary to divide the items in cost finding and the above seems to be the most convenient method of division, and we shall shortly take up consideration of each item separately.

In Fig. 5 we give a graphic chart showing the component parts of a final cost item. The various factors shown as entering into the final cost comprise every possible item of expenditure no matter what the line of manuture may be with which we are dealing. In the case of an institution doing a merchandise sales and manufacturing business it will be wise to isolate or make separate departments of the manufacturing portion of the establishment. To do this the manufacturing end of the business will be charged with its just proportion of all expenses, such as light, heat, power, administrative expense, etc. The manufacturing portion should also be charged with

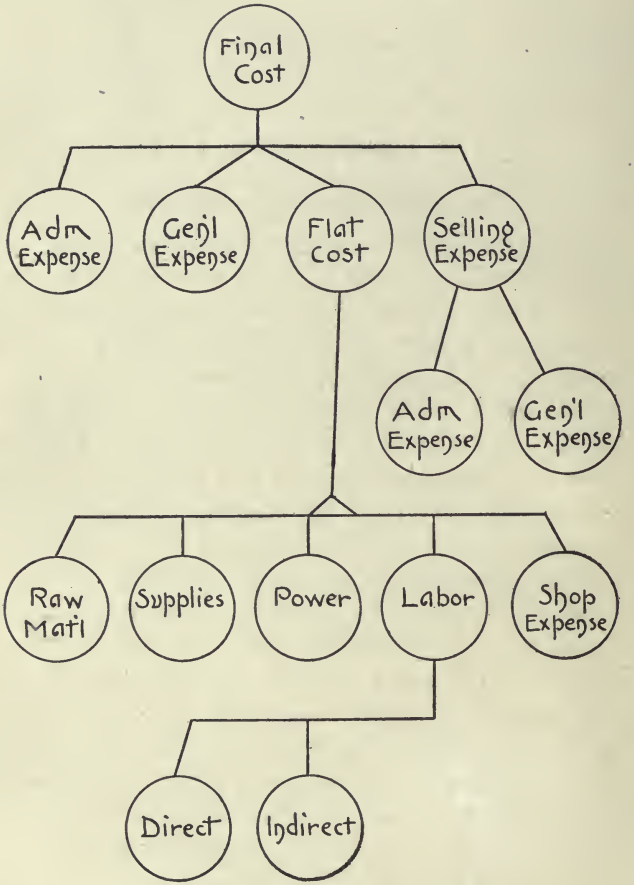

Final Cost
Adm Expense
Genl Expense
Flat Cost
Selling Expense
Adm Expense
Genl Expense
Raw Matl
Supplies
Power
Labor
Shop Expense
Direct
Indirect

FIGURE 5

a rental charge corresponding to plant expense, proportionate to the amount of space it occupies, and it will, of course, be charged with the raw material and supplies used by it, under a similar process to that described in the following pages.

Our cost system, assuming the existence of a properly equipped plant, must provide a means of caring for and recording each and every item entering into the total final cost. Our first case then will be:

### RAW MATERIAL.

Having discussed the organization we will assume that the plant is ready for operation and we will now proceed to consider the various items in the order they will occur in actual practice. The first step looking toward manufacture would naturally now be the procurement of raw materials for use in producing finished product. In considering this question we must deal with the following branches:

Purchasing, including order forms, quotation forms, purchase records, receiving records, rejection records, etc.

Storage of raw material, embracing requisitions for stock, store room records, perpetual inventories, etc.

Next will be considered tool rooms and their conduct and pattern rooms and pattern records, together with a consideration of the proper apportionment of pattern shop expense.

The purchasing agent will find it desirable to keep a complete record of quotations asked and given both as a matter of convenience in following up orders and as a means of verifying prices on invoices of goods received.

A form suitable for this purpose is shown in Fig.

## QUOTATIONS.

Article Raw Linseed Oil

| Quotation Asked | Firm | Quant. | Quoted | @ | | Del'd How | Ordered |
|---|---|---|---|---|---|---|---|
| 1/1-05 | Wright & Lawther | Car | 1/12/05 | | 61 | F.O.B. | 1/15/05 |
| " | W.E. Hills | " | 1/7/05 | | 62 | " | |
| " | Minneapolis Oil Co. | " | 1/8/05 | | 61 | " | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

FIGURE 9

6. A card is provided for each separate article upon which quotations are asked except in the case of large "bills of material" submitted for competitive bids. The card shown is preferably 5 inches by 8 inches in size and if printed on both sides will keep the record of quotations on a given article for a considerable period of time.

The cards may conveniently be filed in a drawer or a desk tray either alphabetically or in sections corresponding to the class of material recorded and when a card represents a current request for quotation or a current order it may be removed to a separate division of the same drawer or tray when it may readily be consulted as a reference for the purpose of following up the quotation or order.

Raw material and supplies are ordered only upon requisition from the proper authority (in most cases the stock clerk or storekeeper). Where the supplies are of such character that no quotation is necessary the requisition itself may conveniently be used as a memorandum for following up the order to make sure that it is promptly filled. A requisition form is shown in Fig. 7.

For convenience in keeping track of orders and purchases a duplicate or triplicate order form is used—Fig. 8. One copy is sent out as the order, one copy is retained as a record and, if deemed advisable, a third copy is sent to the receiving department as a memorandum. If desired, the copies made may be two in number, only the record or second copy being preserved by the receiving clerk who is made responsible for the proper following up of an order once sent out. To follow these orders a daily file is provided with a space for each day from 1 to 31. If the order is set ahead to the proper date and

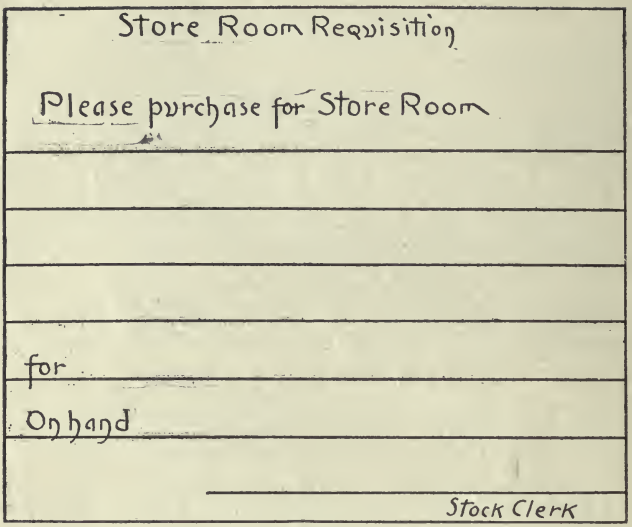



FIGURE 7

each day's memoranda looked over when the day comes round the order will not easily be lost sight of.

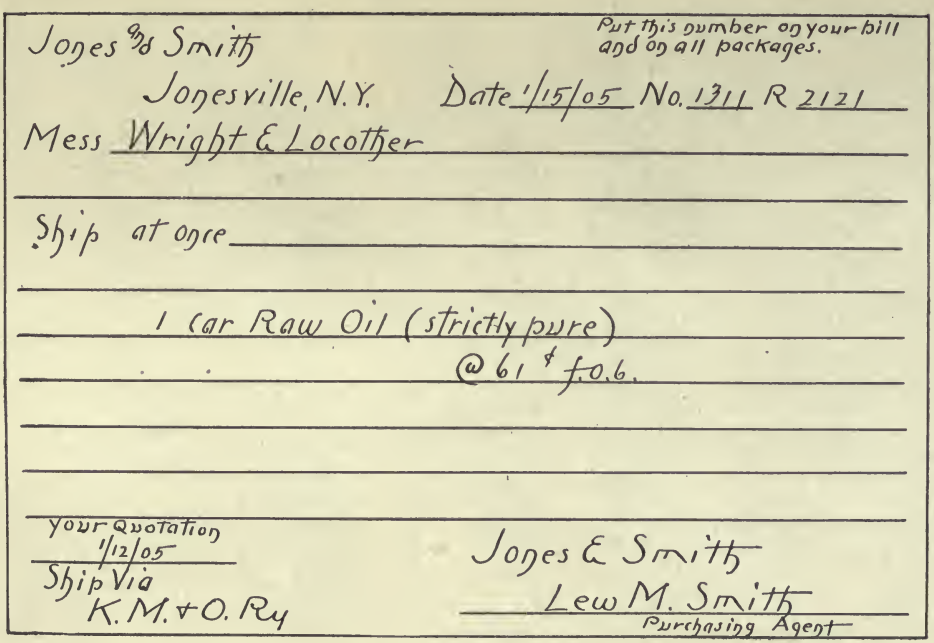
A form of order used by one of our largest firms of manufacturers is shown in Figs. 8a, 8b, 8c and 8d.

Fig. 8a is the order form itself, provided with a perforated slip at the bottom, to be used in acknowledging the order. Fig. 8b shows the shipping instructions—these are printed on the reverse side of Fig. 8a.

Fig. 8c and 8d are respectively original and duplicate bills—forms furnished by the company.

This order and bill system contemplates the use of a voucher system in the accounting scheme of the company and is shown to illustrate the use of special order forms by large buyers.

When a bill is received it should be stamped with



Jones & Smith

Jonesville, N.Y.

Put this number on your bill and on all packages.

Date 1/15/05 No. 1311 R 2121

Mess Wright & Locotter

Ship at once

1 car Raw Oil (strictly pure)

@ 61 ¢ f.o.b.

Your Quotation 1/12/05

Ship Via K.M.+O. Ry

Jones & Smith

Lew M. Smith

Purchasing Agent

FIGURE 8

Requisition #_____ Order No.

Wm. Smith & Sons Eng. Bdg. Co.
Chicago, Ill.

To_____

_____

Furnish the following - ship to Wm Smith & Sons, Chicago, Ill. unless otherwise ordered - subject to conditions on the back hereof - original and duplicate bills for each shipment must be made on enclosed forms. Note this order and req. no. on each bill.

Terms of delivery Ship via

When wanted Signed.
Wm. Smith & Sons

_____
Purchasing Agent.

---

To Wm. Smith & Sons,
Sirs: We acknowledge your order No.___
Req. No.___
We expect to ship_____
Signed
_____

FIGURE 8a

## SHIPPING INSTRUCTIONS

**Itemized Shipping List:**

An itemized shipping list must be sent to us as soon as material has been forwarded on account of this purchase order, giving number of order, kind of material, shipper's name car number and initials, and route by which forwarded. Shipments coming into our yard without notice being sent will be held waiting such notice, and all demurrage will be charged to your account.

**For Shipments in Less Than Car Load Lots:**

In marking material shipped to us under this order, we request that in addition to the mark WM. SMITH & SONS, ENGINE BUILDING COMPANY, you plainly indicate this order number on all material or packages and on shipping orders, or bills of lading in the space provided on the blanks of the various raildoads or express companies.

**For Shipment in Car Load Lots:**

All shipments are to be made to the WM. SMITH & SONS ENGINE BUILDING COMPANY, unless otherwise specified.

When the car load comprises a number of separate articles or packages, each article or package must be plainly marked with this order number.

Each car must be tagged with the name of the shipped and description of the material.

## CONDITIONS

**Quality:**

All materials furnished must be of the best of their respective kinds, and subject to the specifications referred to in or accompanying this order. They are to be subject to our inspection and approval at any time after delivery; if rejected on account of defects of any kind, they will be held for disposition at your risk and expense.

**Quantity:**

The quantity of material ordered must not be exceeded without our permission in writing being first obtained.

**Delivery:**

Delivery must actually be effected within the time stated on the purchase order, failing, which we reserve to ourselfes the right to purchase elsewhere, and charge you with any loss incurred as a result thereof.

Further, it is understood and agreed that in accepting an order the material is to be furnished in accordance withour schedules of deliveries, and that we cannot accept your invoices for credit and make payment for any portion of the material that is forwarded to us contrary to our instructions.

**Routing:**

All material must be forwarded by the particular route named, otherwise the difference in freight and extra cost of cartage will be charged to your account.

**Bills:**

Itemized bills in duplicate, giving our purchase order and requisition numbers, must be sent at the time of each shipment accompanied by a copy of the manifests, otherwise we cannot prevent delays in payment of your account.

**Drafts:**

No drafts for purchases made by this company will be honored.

**Cartage:**

No charge will be allowed for packages or cartage.

**Statement:**

Send statement of account the first of each month.

FIGURE 8b

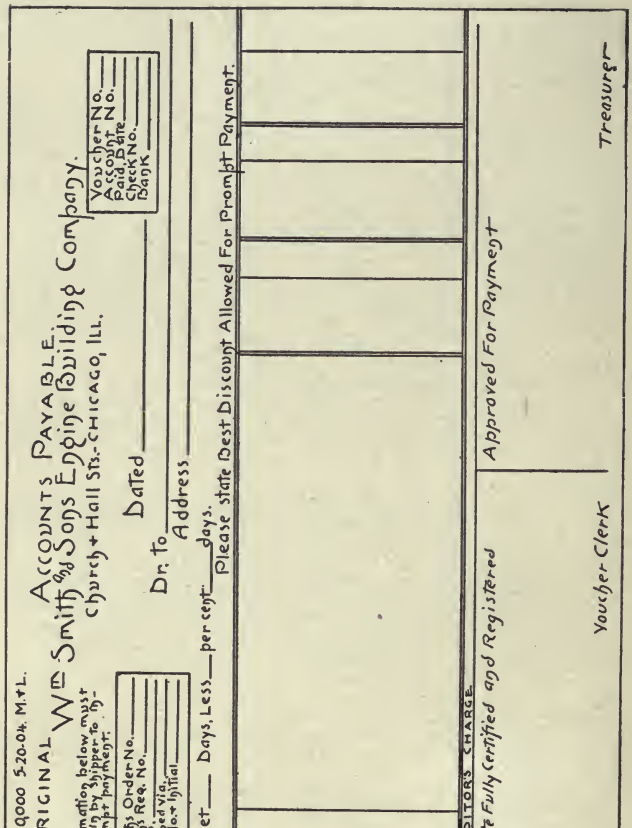
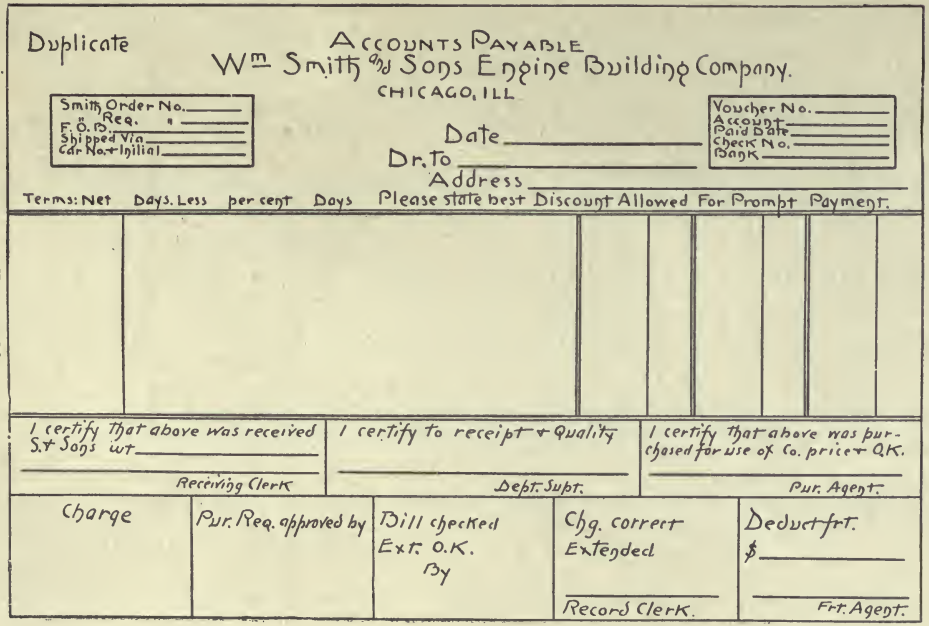

FORM 6.19000 5-20-04. M+L.
ORIGINAL
ACCOUNTS PAYABLE.
Wm Smith & Sons Engine Building Company.
Church + Hall Sts.-CHICAGO, ILL.
information below must be filled in by buyer to insure prompt payment.
Smith's Order No.
Smith's Req. No.
Ship via
Ship via
C&F No.+ Initial
Voucher No.
Account
Paid Date
Check No.
Bank
Dated
Dr. to
Address
Terms: Net___ Days. Less___ per cent___ days.
Please state Best Discount Allowed For Prompt Payment.
AUDITORS CHARGE.
Duplicate Fully Certified and Registered
Approved For Payment
Voucher Clerk
Treasurer

FIGURE 8c



Duplicate

ACCOUNTS PAYABLE

Wm Smith and Sons Engine Building Company.

CHICAGO, ILL

Smith Order No. _____
Req. " _____
F. O. B. _____
Shipped Via _____
Car No. & Initial _____

Date _____

Dr. To _____

Address _____

Voucher No. _____
Account _____
Paid Date _____
Check No. _____
Bank _____

Terms: Net Days. Less per cent Days Please state best Discount Allowed For Prompt Payment.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| | | |
|---|---|---|
| I certify that above was received S. & Sons wt _____ Receiving Clerk | I certify to receipt & Quality _____ Dept. Supt. | I certify that above was purchased for use of Co. price & Q.K. _____ Pur. Agent. |

| Charge | Pur. Req. approved by | Bill checked Ext. O.K. By | Chg. correct Extended _____ Record Clerk. | Deduct frt. $ _____ _____ Frt. Agent. |
|---|---|---|---|---|
| | | | | |

FIGURE 8d

space for the proper "checking up" of prices, etc., a rubber stamp being used if preferred.

A small "paster" or printed slip of paper which may be affixed to the face of the bill is preferable to the rubber stamp because of the fact that rubber stamp entries frequently obscure the items of the bill itself or even fail to find a space for themselves through the lack of clear space on the bill.

Fig. 9 is a form of imprint which may be used for the proper distribution of charges where no voucher system is used—see "Expense Account."

As before stated the typewriter may very well be used to make out these orders, both original and duplicate, and if desirable a triplicate copy being made at one operation. Even though a typewriter be not used it is possible to do this by the use of thin paper for the blanks and good soft carbon paper.

The next step is the receipt of goods and a proper system for recording their receipt. As the bill should become a part of the records of the accountant's office as soon as the material is accepted it becomes necessary to make a record which will provide for the taking of goods into store and will also provide a record of costs for the cost clerk as it is manifestly impossible that the cost clerk should refer to original bills for cost items.

Before material is received all freight, cartage and express charges will have been paid and these charges must, of course, be verified by the receiving clerk who will make entry of the amounts on his receiving sheet Fig. 10.

Some accountants make it a practice to charge freight charges, express charges and cartage to a

No. _____

Amount _____ $123.50

| Department | Amount | |
|---|---|---|
| Stores S1 | 93 | 50 |
| | | |
| Power P2 | 21 | 50 |
| " L1 | 8 | 50 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | 123 | 50 |

FIGURE 9

"freight" account making it an expense item which must be distributed as are other expense items.

This is illogical and inaccurate and not at all permissible if accurate results are desired in the way of cost summaries on individual units. In a factory which produces a bulk output of one sort only it would be permissible but when two or more classes of output are made its use precludes accuracy.

Freight is a part of the cost of raw material. If quotation is received from two separate points on one article, the question of freight charges is always considered before the goods are ordered. It will quite frequently be found that the transportation charges on a certain article will be greater than the cost of the article itself and to record the freight expense in such a way that it must be distributed is to make it possible, to say the least, that a portion of the charge will be borne by some item not entitled to bear it.

The freight, cartage or express charge may be treated just like any other purchase except that its amount will go to the expense records through the medium of the item upon which it was incurred instead of by direct entry.

In Fig. 10, Receiving Room Report, we have a means of charging the freight and cartage cost against the proper item of material. Before freight is delivered the charges are paid or notice of their amount is given at least. This allows the freight cost to be entered in its proper place showing as a result the actual cost of each item as laid in.

The actual entries made on this sheet must be made from the original bills and may be made in part by the

## Receiving Room.

| Date | From | Item | Quant. | @ | Ctge | Frt. or Exp. | Sund. | Total Cost | Unit of Value | Cost per Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/25/05 | W.+L. Co | 1 Car Raw Oil-60 brl | 3000 gal | 61 | | 30 00 | | 1860 00 | gal | 62 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
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FIGURE 10

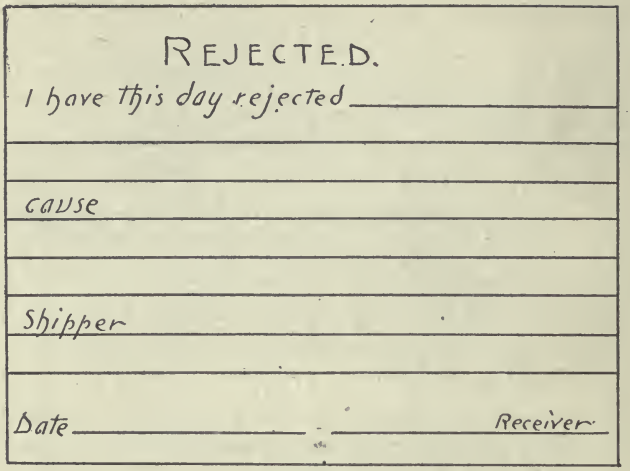


FIGURE 11

accountant and in part by the receiver, or made wholly by the latter as desired. The sheet becomes the cost clerk's record of costs and the storekeeper's record of goods received.

Fig. 11 is a form for rejected goods thrown out in the receiving room, showing cause of rejection, etc. This is sent to the purchasing agent who will see to it that a new order is issued covering the item as all record of the original order will have passed through with the rejection of the goods.

## SECTION VI.

### Store Room.

IN order to be assured that all material used is charged to the job or department using it, it is well to provide that all raw material and all supplies with the possible exception of office supplies be deposited in the store room to be taken from thence only on a properly authorized order or requisition. Materials will be charged to "jobs" where used on specific "job" or production order and to departments when used for departments. A store room ledger will be kept using cards or loose sheets and on these cards or sheets will be recorded all material received and, if the Fig. 12 form is used, all material issued as well.

If this form, Fig. 12, is used it is possible to know at all times at least with approximate accuracy, the amount of stock on hand which, under certain circumstances is very desirable. In many cases an estimate of financial condition is made each month or each quarter and submitted to directors or stockholders. This form of record provides a means of getting the figures as to stock without making an actual inventory each time. In the case of material stored in bulk this is a great saving, as to make a count of the actual pieces or to weigh the material would be annoying in most instances. Where

Store Room — Minimum

Article Raw Linseed Oil

| Bought | Bal. Ford | On hand | Delivered on Requisition | | | | | | | | | | Cost | Bal. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-15-04 3000 W.+L. 1 Car | 225 | 3225 | # 1 300 | 5 600 | 8 600 | 11 600 | 12 300 | 15 300 | | | | | Gal. 62 | 525 |
| 12-1-04 3000 W.+L. Co. | 525 | 3525 | #18 900 | 21 900 | 30 900 | 35 800 | | | | | | | " 62 | 25 |
| 1-25-05 3000 W.+L. | 25 | 3025 | | | | | | | | | | | " 62 | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

FIGURE 12

material is stored in yards—as lumber, pig iron, coke, coal, wrought pipe, etc., the perpetual inventory plan is especially desirable.

Fig. 12 provides for the entry in the first column of the source of purchase and the amount received. In the second column is the amount on hand when the new stock came in, as shown by the records or by inventory. The sum of these two is shown in the third column giving the amount actually on hand. The small squares are for the entry of amounts of stock withdrawn upon requisition giving number of the requisition on which stock is drawn.

In Fig. 13 we have a stock and cost of raw material record which eliminates the inventory system. It will take a trifle less work to keep the store room record on this form but the slight amount of additional work necessary to keep a record like Form 12 will be well worth while when results are considered.

There is sometimes a tendency among cost clerks to keep down the number of blank or printed forms to narrow limits. This is a mistaken idea of economy. It is never advisable to write anything over and over again when it might be used in printed form. There are two reasons for this—1st: because to write what might as well be printed is to do unnecessary work and spend time unnecessarily and time costs money. 2nd: when the best and most convenient form for a record has been arrived at it is foolishness to leave it to memory for reproduction. Better far, have it printed as a measure of economy and accuracy.

Finished stores are preferably recorded and handled just as raw stores are, that is, they are to be put in stock and recorded, to be sent out on requisition only. The

Article Linseed Oil Raw. Minimum

| 5-19-96 W+L 3000 gal. @62 | 8-1-96 W+L 3000 gal. @53 | 9-3-99 M.D.+Co. 6000 gal. @51 | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

FIGURE 13

requisition for finished stores may be a shipping order or such other form as the system in use seems to make the most desirable.

Nominally, at least, the cost clerk will be in charge of the store rooms or store room if both raw and finished stock are to be stored together. There is more chance of waste in the issue and use of supplies and material than in labor even and to put the issue of such material in the hands of someone who is interested in showing low costs is a measure of economy. If desired the superintendent may, from time to time, assure himself of the accuracy of the stock records by demanding at random an inventory of certain items for comparison with the records.

## SECTION VII.

### Tool Room.

AS a tool room is usually incorporated with the store room it will be given consideration next. To begin with, tools are a part of every manufacturing plant no matter what its nature or its magnitude. The investment in tools should, in every case, be treated as a permanent investment. Depreciation should be provided for to an amount which will cover renewal or replacement when replacement becomes necessary. Repairs to tools are, of course, treated as an expense item, the amount to be apportioned as shown in the chapter on "Expense."

The importance of the tool investment varies, of course. In some cases it will be no more than a hammer and a nail puller, in others it amounts to a grand total of tens of thousands. If tools are very few in number they may be placed in charge of the engineer who will necessarily have a certain number of tools in his equipment in any case.

Like every other expense item, tools should be carefully watched in order to prevent waste and to this end someone must be made responsible for their safe keeping, their return when loaned for use, and their replacement when worn out or lost. Also to this end the tool

room should be "checked up" from time to time to make sure that tools supposed to be on hand actually are on hand.

A workman, especially a "piece worker" begrudges lost time in going to and fro for tools and supplies. If he gets one without being made responsible for its return he naturally neglects to return it. Some other workman near him borrows it—soon it is a lost tool. Unless made responsible for a tool the workman is prone to argue with himself that he has no further concern with a tool when he has finished using it. "Let them take care of their own tools," he says. The writer has in mind a shop whose total investment in tools, such as are usually kept in tool rooms, was only $1,800 as shown by the actual inventory taken in detail some six months before. A new inventory was taken as a start for a more careful handling and it was found that over $400 worth of tools were missing. Absolutely no trace to be found of them. "Permanently borrowed," the superintendent said facetiously. Of course a part of these missing tools were used to replace worn out pieces which were thrown away but this fails to explain more than a small fraction of the loss. Among 100 men you will, unfortunately, always find at least one man with loose ideas as to the right of ownership and tools are easily disposed of. More than this, workmen are prone to get new tools long before actual need could be shown. All this is a strong argument for a strict supervision of tools and supplies in the interest of economy and reduced cost.

Where the pay roll system involves the use of a pay check or a personal time card in the possession of a workman the check may be used as a guarantee of the safe re-

turn of a borrowed tool. Suitable racks are provided for tools which racks should be so arranged as to show at a glance the absence of any tool. When a workman calls for a tool he presents his check in exchange, the check being deposited in the tool's stead. As the workman cannot get credit for his time without his check it necessarily follows that he will return the tool and get his check as a matter of self interest. Where a check system is not used a personal receipt may be taken by the tool room keeper, or tool checks may be provided and issued to men who have occasion to use tools. In the case of tools furnished a workman for permanent use a place must be provided for their safe keeping during such times as their user is away from his post, this to prevent their appropriation by a fellow workman who may be in need.

When new tools are issued to replace those worn out the worn out tools are returned to the store room to act as proof that new ones are needed and should a workman be discharged or paid off a tool room discharge must be insisted upon by the timekeeper before issuing a pay check.

## SECTION VIII.

### Pattern Shop.

A NICE question arises at times as to whether certain patterns are an item of expense or an item of investment. No general rule can be laid down which will fit all cases, but generally speaking permanently used patterns are an investment subject to depreciation just the same as any other investment. Patterns will be produced upon orders just the same as another item of manufacture and if they are to be of use on one job only their whole cost will be borne by that job. Experimental patterns must necessarily be regarded as an expense. Patterns of all sorts suffer little, if any, depreciation in actual use but there comes a time in the experience of a manufacturer when certain patterns like certain machines become obsolete, because they have been superseded by improved forms. Experience must be the guide as to the probable life of a pattern and during its life its whole cost should be paid by the product made from it. (See Depreciation.)

Under this head will naturally come all experimental work of any character, charging all such work at actual cost to the proper accounts. In engineering or iron working concerns and also in many wood working concerns we have another department—the drawing room—where plans are made for future work. This item is treated in all respects as the preceding.

## SECTION IX.

### Labor and Its Records.

IN very many cases, labor is the greatest item of cost of production, far exceeding cost of raw material. An accurate apportionment of labor charges is absolutely indispensable to a good cost system.

Taking into consideration the fact that it is so great a factor it seems very strange that so little attention is paid to its purchase and care in very many instances. A buyer or purchasing agent is selected with care. He must be experienced and well able to tell whether he is getting just what he pays for. Merchandise when received is examined carefully and is carefully stored in order to prevent waste. Labor, on the contrary, is very often purchased (or hired) by incompetent persons and when purchased is permitted to waste itself in a way which would not be tolerated for a moment in the case of merchandise. Waste of labor is of many kinds. Waste because of laziness on the part of the workman; because of ignorance, because of poor shop arrangement and so on. It is economy to make all work as easy as possible, even though it may cost something to do it. Keep a satisfied set of men if possible—its costs money—wastes time—to "break in" new men. Make it easy for a workman to call attention to unsatisfactory things through the adoption of the

"suggestion" system. Many a man in your employ can call to your notice little ways of making improvements and improvement means decreased cost—do not lose sight of that.

For these suggestions an Egry register is quite applicable. It provides an ever ready blank for the suggestion and as soon as the suggestion is made it is put beyond the reach of anyone not authorized to remove it—see chapter on "Mechanical Aids."

It is not pretended that all suggestions received from the men will be practicable. Some of them may even be ridiculous, but it will be advisable to acknowledge each one, commending those which have merit and pointing out the weak spots in those which have not.

It is of course assumed that a record will be kept of the general character of each man's services while in the employ of an establishment which claims to be well organized. This involves but a trifling amount of work and is an invaluable record in many instances. In these days of organized labor men will occasionally go "on strike" and it is quite advisable from the point of view of the management that malcontents and mischief makers be kept permanently off the pay roll when once they have been taken off. Again, this record may be very valuable as a record of past performance in case a man is re-engaged after once leaving the service of the concern. To trust to memory in this, as in other things, is a bad idea when it is easy to make and keep a permanent record of facts.

Those empowered to engage men for service are provided with a blank upon which to report new men engaged. Fig. 14.

This is handed to the timekeeper who fills out a

To Time-keeper
Name

Address

Has been employed by me as

Rate of pay

Date

FIGURE 14

record card and assigns the workman a number by which he will be identified on the pay rolls and records. Fig. 15.

When the workman's engagement terminates, the fact is reported to the timekeeper on Form 16 and the cause given, whatever it may be. When a significant fact in connection with the workman comes to light, entry of the fact is made on the card where it becomes a part of a permanent record.

It may be arranged if desired, in order to save time, to place the record shown in Fig. 15 in an abridged form on the back of Form 14.

It next becomes necessary to provide for the making of a record of the presence or absence of each man during each part of every working day and for this purpose there are a multitude of devices.

Automatic devices have much to recommend them, a principal point being that many disputes are avoided

EMPLOYE'S RECORD.

Name

Address

Hired By As @

Transfer
Date to Date to

Age Former Employer

Discharged By Why Date
Resigned
Laid off

FIGURE 15

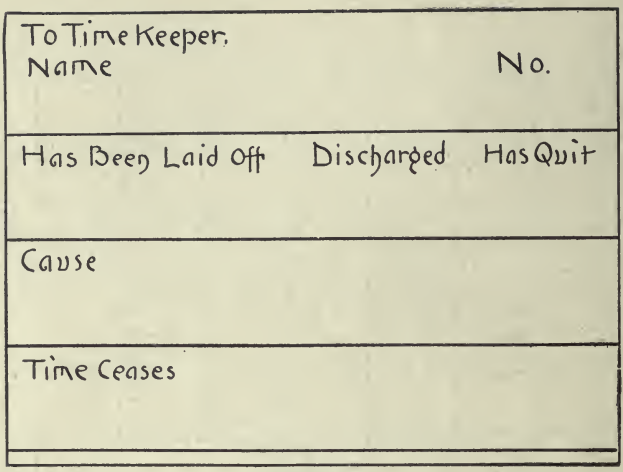


FIGURE 16

by providing a means of recording the time by the workman himself. When he, himself, makes the record all question as to its authenticity is done away with.

The old system was to provide brass checks stamped with the pay roll number and issue a check to each man each time he entered or left the works. Two plans are used in issuing these workmen's checks: In the first plan the workman presented himself at the timekeeper's window, calling out his number and receiving his properly marked check which he retained during the forenoon. A "turnstile" prevented the workman from going out again and again coming in as it would be possible if free egress were allowed, for him to return, call a different number and get a second check, thus showing the presence of an extra man.

In this system a rack was provided with hooks enough to accommodate a check for each employe, the

hooks being numbered to correspond with the check numbers and the check left on the rack when the men had ceased coming in showed the numbers of the various men who were absent or late. In some instances two check marks were made on the time book, the first being made 5 or 10 minutes after the opening hour, showing tardiness on the part of the workman checked. The second check mark was made a little later, showing absence for the first half of the day.

When this check system was used it was necessary for the timekeeper to make a visit to every department each morning and afternoon to "check up" the men at work or else to provide the foremen with a time book which they checked each day for presence, tardiness or absence and which would be compared with the timekeeper's record at the expiration of the pay roll period.

Each man turned in his check at noon in this plan and during the noon hour the timekeeper hung up the checks on the rack.

If any was found missing after the checks were all returned to the rack it would mean that a special investigation must be made of that particular number in order to be sure that the man bearing that number on the pay roll had not surreptitiously left the works during the morning without turning in his check, hoping thus to draw for a portion of time during which he was not at work.

The same process would be gone through with in the afternoon, the checks being turned in again at night.

In certain instances this process was reversed, the workman taking his check upon going out at night and returning it when coming in in the morning, but the method of operation was the same as in the first example spoken of. The first plan was the one most generally

followed in the older establishments and as a matter of fact it is still in operation in many factories which are otherwise up-to-date.

A number of devices for automatically recording time of workmen, etc., are shown in a special chapter on "Automatic Aids."

Where a clock system is in use, it is unnecessary to use a time book for recording the total time of each man as the clock record takes its place. As suggested elsewhere, the man's check or clock number will indicate at a glance just which department they are chargeable to and the clock cards or clock record is to be posted directly to the pay roll. Where the time of a certain workman is to be definitely apportioned among certain departments, the workman himself may keep a time card, although it is well to avoid the making of record cards by the workman so far as possible. A card for personal record of departmental distribution of time charges is shown in a later chapter, as it sometimes seems unavoidable that this scheme be adopted in spite of the objections to it.

## SECTION X.

### Labor.

IN considering the recording of time-work and piece-work, it may not be amiss to say at the beginning that it has been the writer's experience and observation that the "works" enforcing the strictest rules as to the conduct of its employes were the ones who seemed always to have the most contented set of workmen. No matter how many or how few men you may employ you will always find two classes. One class is the careless, heedless, shirking sort who will take advantage of your laxness or lenience in every possible way. If nothing is said about tardiness a man of this class will be 5 or 10 minutes late practically every time he comes into the works. He may be a good workman but he simply cannot conform to rules unless he is forced to do so. The other sort is the conscientious man. He knows that he could safely violate the rules for he sees "the other fellow" doing it constantly, but he has a conscience which makes him uncomfortable when he does chance to violate the regulations in question.

Now it is plainly an injustice to the conscientious man to allow someone else to disregard rules and regulations which he *will not* disregard. It makes the conscientious man discontented; he imagines that favoritism

is shown; he says to himself "they would not let me do that," although he knows you would, and discontent is a poor asset among a lot of workmen.

A cheerful, contented lot of men will make three times the amount of money for you that a morose, dissatisfied gang will for they put heart and enthusiasm into their work.

It is a common rule in large shops now to require all men in their places when the whistle blows, and to insure this it may be necessary to *close the gates* at the opening hour. If the whistle blows at 7 A. M. the gates will be closed at the stroke of the hour and a man who is *one* minute late is compelled to wait until 7:25, at which time the gates will be reopened for five minutes, closing again at 7:30. A workman who is shut out at the first closing will, of course, lose ½ hour. The gates will be again opened at 7:55, to be closed for the morning at 8:00 sharp, and the man who comes in during this second opening of the gates loses a full hour. This may seem drastic to those superintendents who have never enforced such a rule, but it saves money, which, after all, is the first consideration, and in operation it will be found that it works a hardship to none. No one, or practically no one, losses any time for all learn to *come on time*. Of course, if the rules on the subject of tardiness have never been strict or never been enforced, it will be necessary to be cautious in putting new rules in effect as too radical a change would produce a bad effect. It will be found a good plan to have a printed notice posted in the works and also to have a printed slip put in each pay envelope once or possibly twice a month previous to the date on which it is intended to put the new rule in effect.

It is hardly necessary to argue as to the advantage

of having all workmen on hand promptly or to quote the old formula showing how many hours are lost if 100 men are late 5 minutes on 100 days each, and even if such stringent rules as those above noted are not approved of it will doubtless be admitted that some plan should be adopted which will result in more promptness. To this end a good example should be set by those in immediate authority over the workmen. A foreman having immediate charge over and direction of a gang of men should realize that it is his duty to his employers to be "on time" just as strictly as his men. He is put in his position and paid a salary to see that each man does what he is hired to do and he cannot do this unless "on the spot." If strict rules are laid down for a workman, rules of the same strictness should be laid down for the office force, and not only laid down but *enforced.* Office hours will possibly be different in arrangement from factory hours, but whatever the hours laid down, they should be as strictly adhered to.

Many office men object, on sentimental grounds, to a mechanical registration of their entrances and exits, but the writer cannot see why a man who sells a given amount of time (for that is what it amounts to) for a given price, should object to rendering daily an itemized bill for what he has delivered, and an itemized bill from each employe is what a mechanical record really is in its final analysis.

### LABOR CLASSIFIED.

Labor falls naturally into two classes, as viewed from the cost accountant's view point. 1st: That class of labor which is directly engaged in producing some individual item of manufacture—some unit of production. This for convenience we will call "direct" labor.

2nd: All labor which has a general effect but does not produce or help to produce any individual article or unit of production, although it is necessary in order that the direct labor may produce results.

This latter class includes watchmen, sweepers, truckers, etc.

Engine room labor may be placed in this class or a separate department made of the engine room and all labor performed in that department charged to it as a department.

"In most cases this latter plan is best as the 'coal pile' usually represents a big investment with very great possibilities as to waste or economy. Much depends upon the care and watchfulness of your engineers and firemen, and it is a good plan to establish a system of special awards or prizes for special coal economy. This may easily be done by keeping a careful coal record, etc. It is usually possible with very little trouble or expense to install a scale where the coal barrow or 'lorry' can be run upon it and the weight recorded."

There is no possible doubt that the "piece price" system of payment for labor is far better as to results than time work wherever it is possible to establish it. In the first place, it reduces the expense of superintendence. The writer has in mind a shop which employs some 400 men. Under the "day work" or "hourly wage" plan a force of 15 to 20 foremen was maintained because found necessary to keep up any semblance of activity and any reasonable standard of excellence of output. Under the piece price system four foremen attend to the whole force and the cost of inspection of work is reduced to a minimum—for the men are paid for perfect work only. In connection with piece work a bonus system may often be used with

good effect. This system contemplates the fixing of a minimum output for each man. A workman who cannot reach this minimum steadily day after day is held to be not worth shop room and his place is soon filled by a more able worker.

A workman who produces, say 25 per cent more than this minimum quantity, is paid a "bonus" or reward apart from the regular "piece rate." This bonus is increased as individual production increases up to the "bonus limit" set by the management.

The economy of this stimulating production is at once apparent when we consider that a workman producing the minimum quantity is charged in theory with his share of shop expenses—heat, light, power, rental, etc. Should he produce twice the minimum quantity the charge against his output could be no greater and the expense per unit is cut in two. The bonus simply gives the workman a part of the saving.

Prices for piece work should, of course, be fixed by experience, or in the case of a newly established factory, by careful experiment. It is always wise to consider well before fixing piece prices, as it is not advisable to change the prices after they are once fixed and understood by the workmen unless absolutely necessary. Many cases have come to the writer's notice where piece work prices have been fixed, based on the considerable decrease in cost over the result shown by the day work payments. After the piece work plan had been in operation for a time it was found that the workmen were making in some cases more than double their former day rate. An attempt to reduce the piece work price in order to cut down the average pay to somewhere near the former day rate resulted in serious upsettings of the factory's relations with the workmen.

From the workman's point of view a reduction of the piece price was a gross injustice; therefore, it is wise to consider the price before fixing it, and it is better to have it a little too low instead of too high, as it is always easy to raise the price while it is not so easy to lower it.

The most serious and practically the only drawback in the piece work plan will be to provide for inspection of finished work. In piece work the natural tendency of the workman is to increase his rate of production to such an extent as to make him careless as to the quality of his work, and as a consequence a very strict inspection is necessary. In some cases a system of fines or penalties is used in order to insure the necessary care and painstaking on the part of the workman.

A penalty plan in operation in a clothing factory recently inspected by the writer operates as follows: The various operations, including seaming, buttonhole making, putting on buttons, etc., are paid at piece rates, the final operation being the packing of the clothing in bundles. The workmen making these bundles are paid a small salary for making the bundles and are paid a specific amount for each imperfection or deficiency they discover, thus, for a button imperfectly put on, or omitted altogether, 5c is given the inspector; for a narrow seam 5c, for an imperfect button hole 2c, etc. The bonus above mentioned is deducted from the piece work pay of the operator, and has thus a salutory effect in making a piece worker as careful as possible in getting out the work, because it is practically certain that the imperfect work will be detected and the penalty enforced. This plan operates very successfully in the factory above referred to and results in a uniform excellence of output at practically no cost for inspection.

FIGURE 16a—Operator's piece work card—clothing factory—Manilla board.

Week _____

| Lot | Pair | Size | Total | Cutter No. |
|---|---|---|---|---|
| | | | | |
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FIGURE 16b

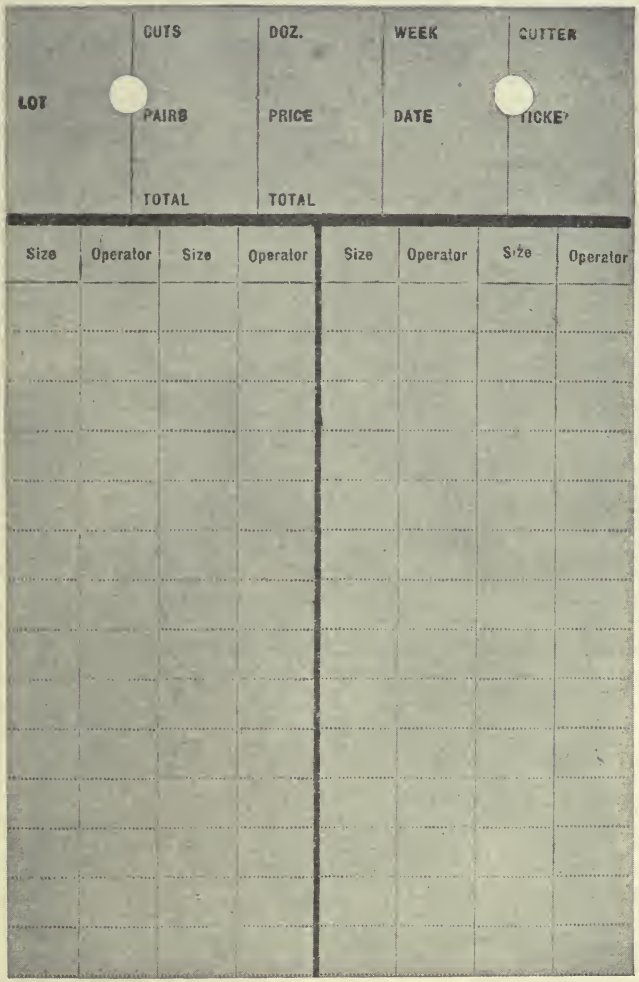
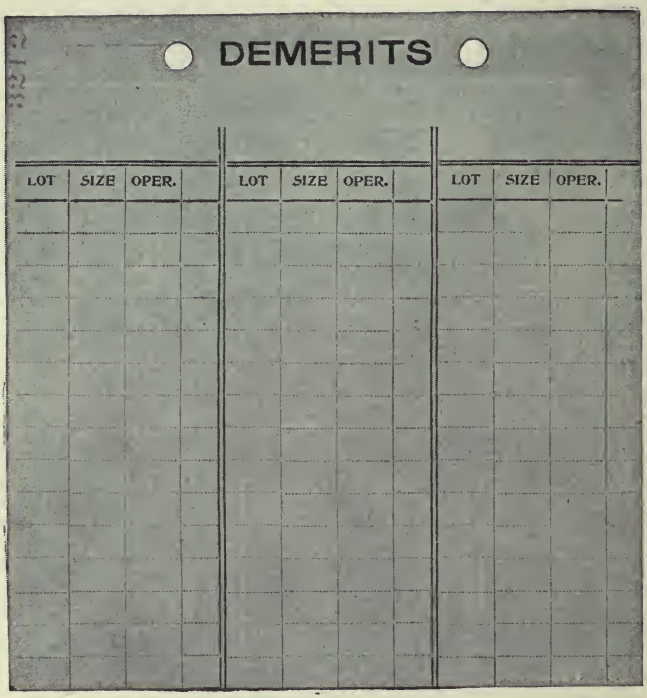



FIGURE 16c—Piece Work Distribution Record. Manilla card 8x4¼



DEMERITS

| LOT | SIZE | OPER. | | LOT | SIZE | OPER. | | LOT | SIZE | OPER. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
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FIGURE 16d—MANUFACTURING COSTS.
Record of Demerits—Inspectors are paid stated sums for all defects found by them, these sums being charged against the operator responsible for the defect.

The forms used in this piece work plan are shown in Figures 16 A, 16 B, 16 C, 16 D and 16 E.

In this establishment the time is identified by numbering the weeks in the year from 1 to 52, the first number being the beginning of the fiscal year.

Another plan of the same character was recently observed by the writer in a large stove works. The ordinary inspection of castings was made when the cleaning was done, but this inspection was necessarily more or less

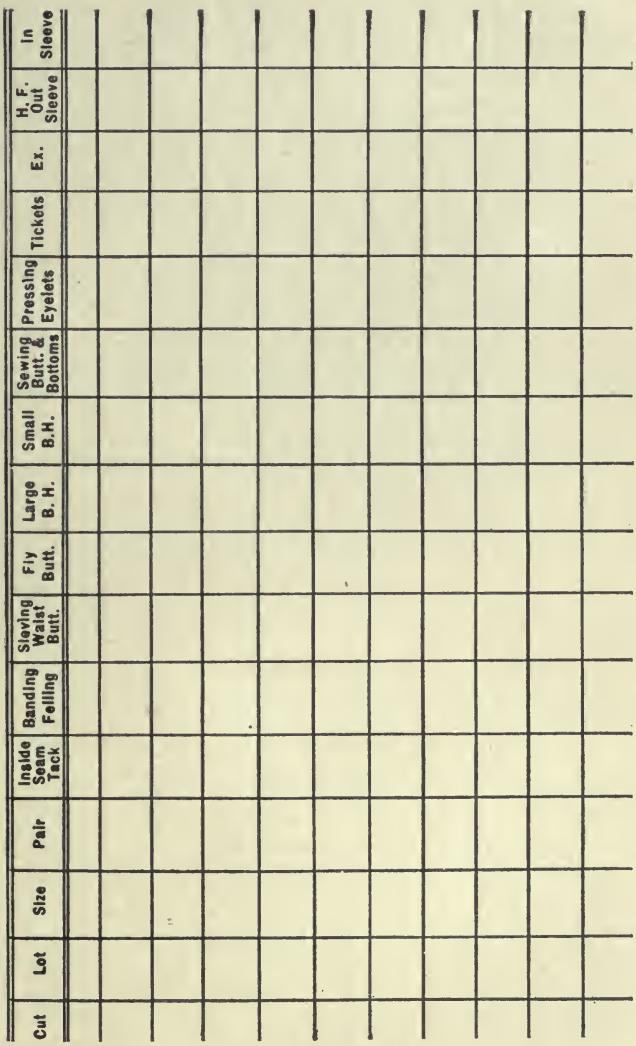

Cut
Lot
Size
Pair
Inside Seam Tack
Banding Felling
Sleving Waist Butt.
Fly Butt.
Large B. H.
Small B.H.
Sewing Butt. & Bottoms
Pressing Eyelets
Tickets
Ex.
H. F. Out Sleeve
In Sleeve

FIGURE 16e

hurried, and in order to make sure that no imperfect castings of any character were used, the stove mounters, that is, those who assemble the castings into the completed stove, were made the final inspectors. The mounters being paid by the piece, it necessarily became vital for them to make sure that no castings which were imperfect be put into a stove. If an imperfect casting was found in a stove on its final inspection after completion the loss fell upon the stove mounter, for an imperfect casting detected in his completed work resulted in the rejection of the stove and the workman was consequently compelled to take it down and substitute a perfect casting for the rejected one.

## SECTION XI.

### All Manufacturing Plants or Factories Will Come Under One of Two Classes.

CLASS ONE.

FACTORIES producing individual units of sale, that is, articles of separate form or character, making it possible to describe each unit by name or number. In a factory of this class it is desirable to arrange the cost system so that the cost per unit or per thousand can be shown with absolute accuracy.

For instance, we will mention a tin can factory—a shop making hats—a watch factory, etc. In all factories of this class the manufacturer must know just the amount of raw material and the exact cost of labor used in the production of each can—each hat—or each watch.

CLASS TWO.

In this class will be found all factories producing a continuous product of one sort or of several sorts. In this class we find flour mills, paper mills, nail mills, textile factories. In factories of this class the cost of a process is desired, that is, the cost of each individual yard of material or pound of paper is not necessary since each yard or pound produced under the same conditions during a given period will be the same. The usual pro-

cedure in factories of this class is to arrive at average costs during a given period.

To do this we must know just the amount of raw material used during a certain period, also the cost of labor and the expense of the factory during that time. The total output is then ascertained and the average cost per ton, pound, yard, etc., is easily found.

Where separate grades or sorts of output are produced it is simply necessary to apportion the expense and labor among them which is usually an easy matter as a certain machine or set of machines runs continuously in the production of certain sorts or grades.

## SECTION XII.

### The Production Order or Shop Order.

THE factory production should be the result of specific orders issued by a duly constituted authority, preferably the superintendent or his assistant, and in order to make a cost system effective it must be distinctly understood that no work is to be undertaken without the authority of a shop order. In factories of certain classes it sometimes chances that certain work must be done immediately. This emergency work can be provided for by the issuance from the superintendent's office of a limited number of blank orders which can be put into force by the foreman and by him reported back to the superintendent as promptly as possible.

The general place of a shop order in the factory cost system is shown in the diagram Fig. 17. In the beginning of the operation of issuing a shop order we must necessarily have a means of recording all shop orders issued that they may be kept under the superintendent's eye until they are finally completed. This shop order record can very easily be made a record of costs also and if desired it can be kept in connection with the order record as well. If properly arranged this shop order record can be made to take the place of all other cost records of every character, being a final summary of the

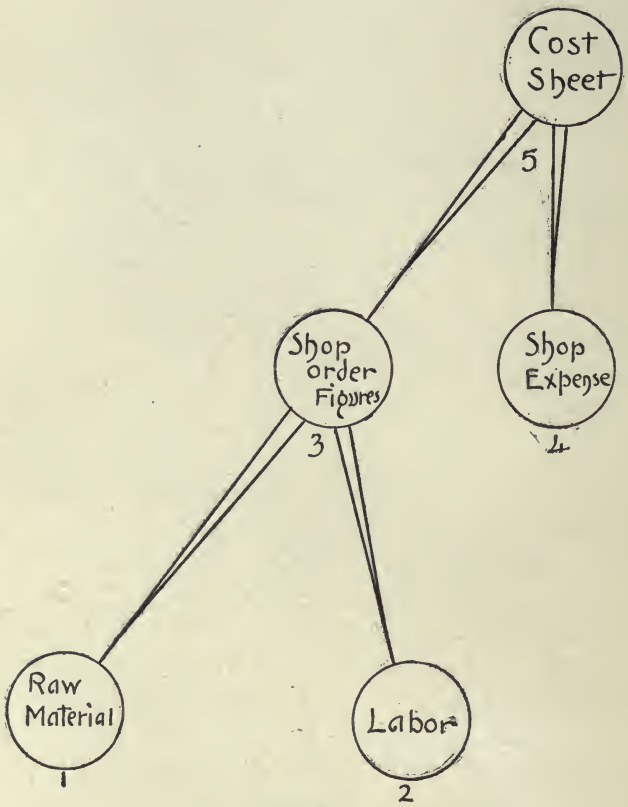
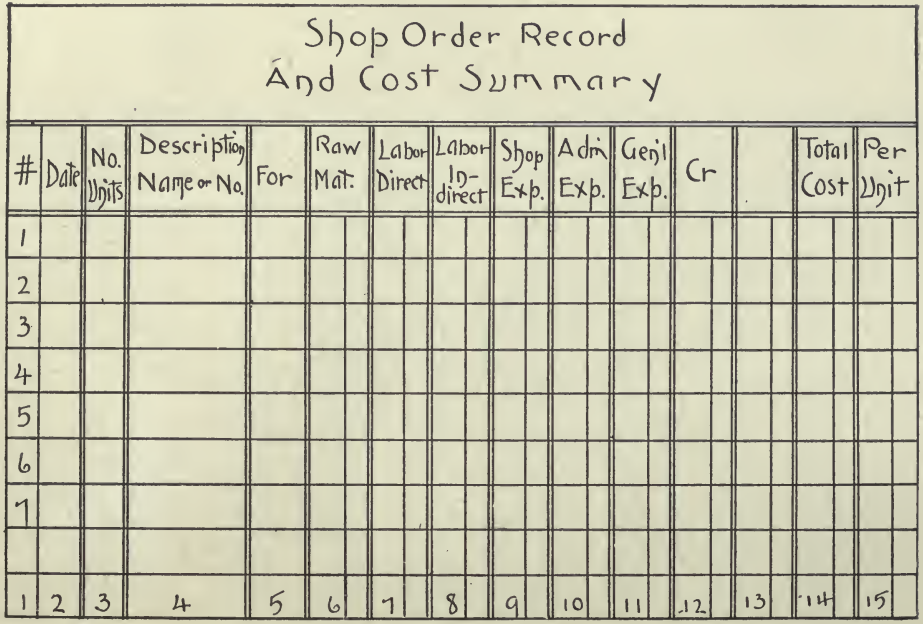

Cost Sheet
5
Shop order Figures
3
Shop Expense
4
Raw Material
1
Labor
2

FIGURE 17

total cost of each shop order. It is the practice in very many manufacturing institutions to keep an elaborate set of cost books. In one institution which came under the writer's notice a cost ledger, a material journal and a shop order journal were kept and a complete system of book-keeping established similar to the old-fashioned systems in vogue in handling the general accounts of the institution. In this day of improved appliances the constant aim and effort is to simplify each operation and each record. This tendency has displaced many a record book and done away with much unnecessary work in the office of the general accountant, and as a consequence has not only promoted accuracy but reduced expense. Each time any entry is copied or transferred from one record to another we not only entail additional work, loss of time, and expense but we multiply the possible chances for error. It naturally follows then, that all records should be as simple as they can be made consistent with accuracy and accessibility for purposes of comparison. There is no reason why an elaborate set of books is at all necessary as the cost accounts are in no wise a part of the general accounts. Even a cost ledger is unnecessary if a properly designed cost sheet is used. Let us analyze the subject. What do we wish to know? We desire to know the cost of all items entering into the production of shop order No. 10, we will say: Our cost sheet, which may be, at the same time, a shop order, gives this, while the order itself filed under proper conditions gives us a means of comparing costs on any article or product produced at various periods. Having done this we have fulfilled the whole purpose and further records are unnecessary.



Shop Order Record
And Cost Summary

| # | Date | No. Units | Description Name or No. | For | Raw Mat. | Labor Direct | Labor In-direct | Shop Exp. | Adm. Exp. | Genl Exp. | Cr | | Total Cost | Per Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

FIGURE 18

It must be remembered that this shop order is the foundation of the whole cost system and through it the comparisons are made. From its total costs (as to material, etc.) the apportionment of indirect labor and general expense is calculated.

However, it is recorded the record must be such as to provide for tracing its progress continually in order that it may be always under inspection.

SHOP ORDER RECORD.

Our shop order record should be a complete history of the various steps involved in the production of any given amount of product and the cost of that product, both as a whole and per unit or per thousand units as the case may be.

A suggestion for such a record is shown in Fig. 18. The course of procedure is the same in any case, whether the order covers the production of a number of units for permanent stock, a single unit or a number of units for a definite sale, or an operation for repairs or plant betterment.

This form—Fig. 18—is a mere suggestion as it will necessarily be much modified to suit individual needs. If it should be considered advisable to make the order record and shop order record on one sheet it may be done by inserting the proper columnar headings. The record here shown comprises the following:

1. Shop Order Number—This number is a permanent identification and is borne by each requisition and subproduction order issued against it.

2. Date—The date on which the order was issued.

3. Units—An order may be issued to cover the production of one unit on a special order or possibly ten

thousand units for stock if the order is for some article of ready sale.

4. Description—Preferably by number.

5. For——.Here is entered the sales order number or such other identification as may be desired.

6 to 13. If possible it is well to record all shop orders for a certain department on a separate sheet or in a separate section of the sheet in order that the cost items in columns 8 to 11 be entered in lump sums if deemed advisable as it sometimes may be.

See apportionment of general costs and expense to separate units of production.

THE ORDER TO PRODUCE OR SHOP ORDER—ITS HANDLING, ETC.

This shop order is merely a form of instruction to whom it may concern to make or produce a certain thing or things, and also an authority for the use of certain labor and material in the production of these things. Its arrangement will, of course, be subjected to the exigencies of the business in which it is to be employed. In the first place its color may be made to indicate very much as to its nature. As an illustration: a white order may indicate instructions on a product for regular stock. A green order may indicate a special order for material to fill a specific sale. A red order may indicate one, the completion of which must be rushed through as rapidly as possible. A pink order may indicate instructions for plant betterment, etc. Just here let it be said that if this color scheme is adopted or any modification thereof, it will be absolutely necessary to use the utmost care in seeing that the proper colors are used only for the proper purpose. Take the red order for instance. This order is supposed to be used only when the greatest hurry is absolutely es-

Shop Order # 10

Sales Order

Date _____

MAKE

Work Orders _____

Requisition No. _____

_____

Supt.

FIGURE 19

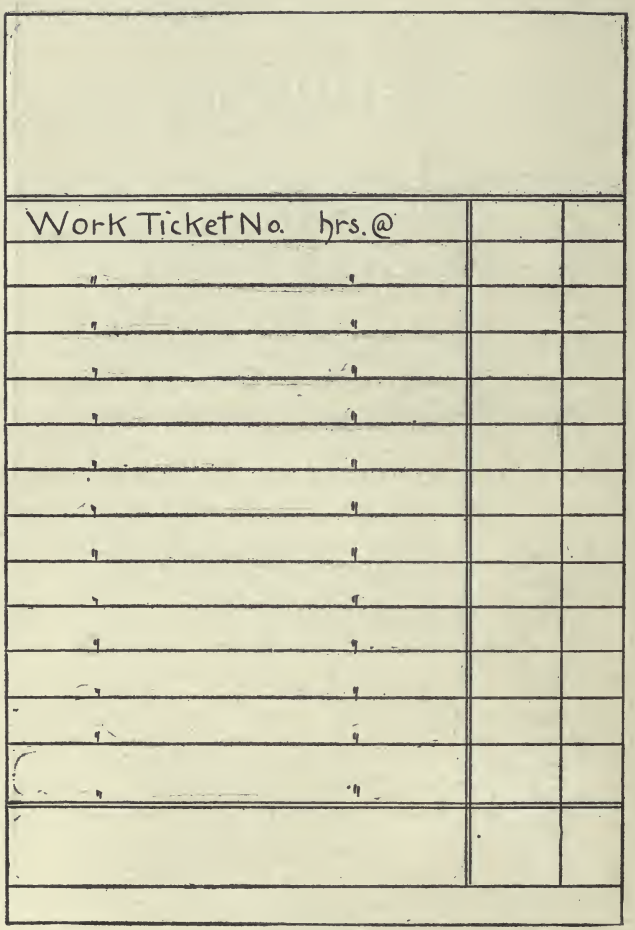



FIGURE 20

sential. To get into the habit of using this red or rush order under any other circumstances finally results in a complete disregard of the rush feature. In other words, it is the old cry of "Wolf! Wolf!" when there is no wolf, and finally when the red sheet is used in a rush order its previous abuse will result in so much inattention that the purpose of the order is entirely defeated. The shop order forms shown here are, of course, merely suggestions.

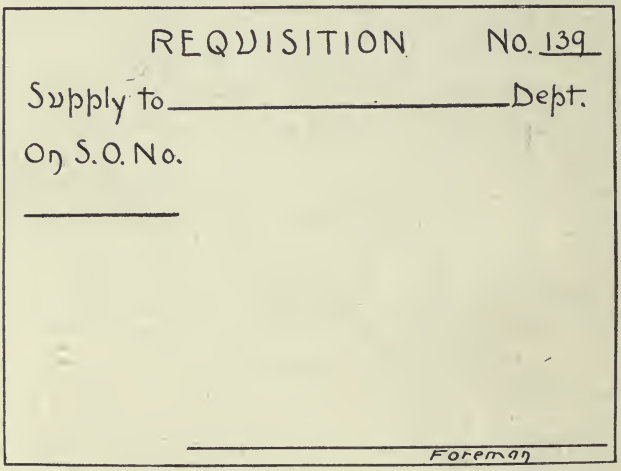
Like every other form, each line of manufacture must have them made up in a way most suitable to its own special requirements. It is easy to multiply forms and illustrations as used in this, that or the other factory, but to do this results in no benefit to the reader, as specific forms used in any specific lines of business are necessarily so largely fundamental that they are applicable to that line of business and no other. No two concerns could use the same system, even in the same line of business. Hence, as stated above, these are merely suggestions.

In settling upon the forms for special uses it should always be made a point to have as much as possible of the form printed. This both lessens the probability of mistakes and saves large amounts of time. If an order is to be issued for one of four articles only, we will say, on the form should be printed the names of all four, and in issuing the order cancel the three not wanted or check the one which is wanted, whichever may be deemed the more convenient.

In some instances the shop order will be a detailed description of the product desired, and may even necessitate accompanying plans, specifications or blue prints. In other cases the shop order may merely refer to the name or number which designates a certain product, thus neces-

sitating perhaps a reference to a standard pattern or description. All this is mere detail which, of course, will affect no other instance.

The form shown in Fig. 19 is a very simple one. This is filled out, signed and sent to the foreman and the reverse side will be found blank for recording the summary of labor expenses incident to the production of the article or articles ordered. Fig. 20. After this order reaches the foreman or the one to whom it is first consigned, the first step is to procure for use the necessary




FIGRE 21

amount of raw material for the production of the goods ordered. For this purpose a requisition is made by the foreman or his clerk, the requisition being addressed to the storekeeper. A form for this requisition is shown in Fig. 21. In due course the storekeeper sends this requisition to the proper party in order that the material delivered may be charged against the shop order. In the

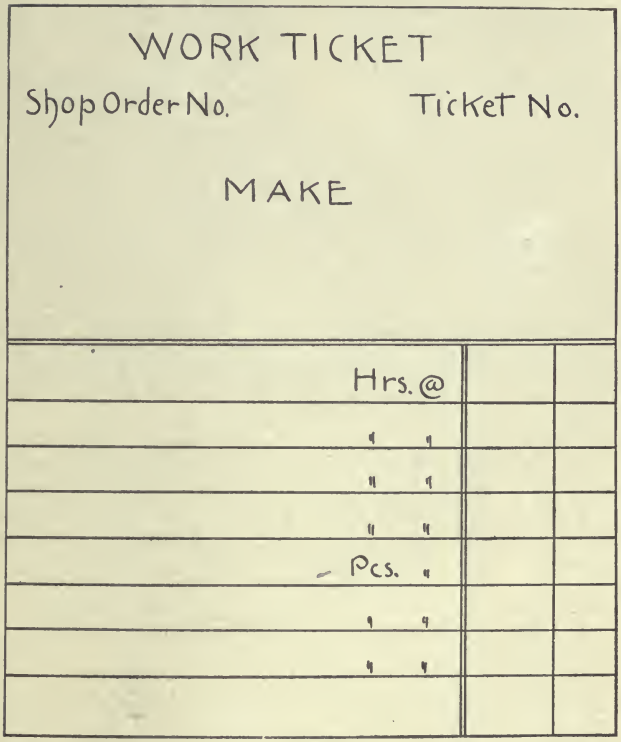



FIGURE 22

space provided on the requisition, the foreman or his clerk notes the number of the shop order and notes the identifying number of the requisition issued to the storekeeper—on the shop order. This done and the raw material procured the next step is to issue instructions to the workmen who are to perform the various operations incident to the production of the articles ordered. As many separate instructions or work orders should be issued as there are separate operations or separate men

engaged on these operations. On the face of the shop order should be noted the exact number of work orders issued on that particular shop order. That there may be no possibility of a failure to charge against the shop order the labor apportionment of these work orders. The work order, Fig. 22, is a mere formal instruction to the workman to perform a certain operation. In the case of workmen using separate machines these orders can very readily be printed and delivered with the raw material. This is particularly the case where the various operations are continuous; that is, where the raw material and that partly finished passes from hand to hand, the operations being progressive until the entire work is complete.

This form of work ticket—Fig. 22—contemplates the use of a time stamp—Calculagraph, or other mechanical device for registering the elapsed time or the time consumed. The Calculagraph is a very satisfactory device for the purpose (see "Mechanical Devices" chapter —).

Fig. 22 "a" is an illustration of a similar work ticket with time recorded in this machine.

Where it is not deemed advisable to use a mechanical device for this purpose, a form like Fig. 23 may be printed on the face of the work ticket, the workman checking in pencil the starting and stopping times, both A. M. and P. M.

Material overdrawn on any order should be returned to the store room and a credit slip issued by the storekeeper, the amount shown on the slip to be credited to the proper shop order on the cost sheet.

Where the piece work plan is used, a shop order is quite frequently made to do duty as a work order as well, the shop order going direct to the workman. This may

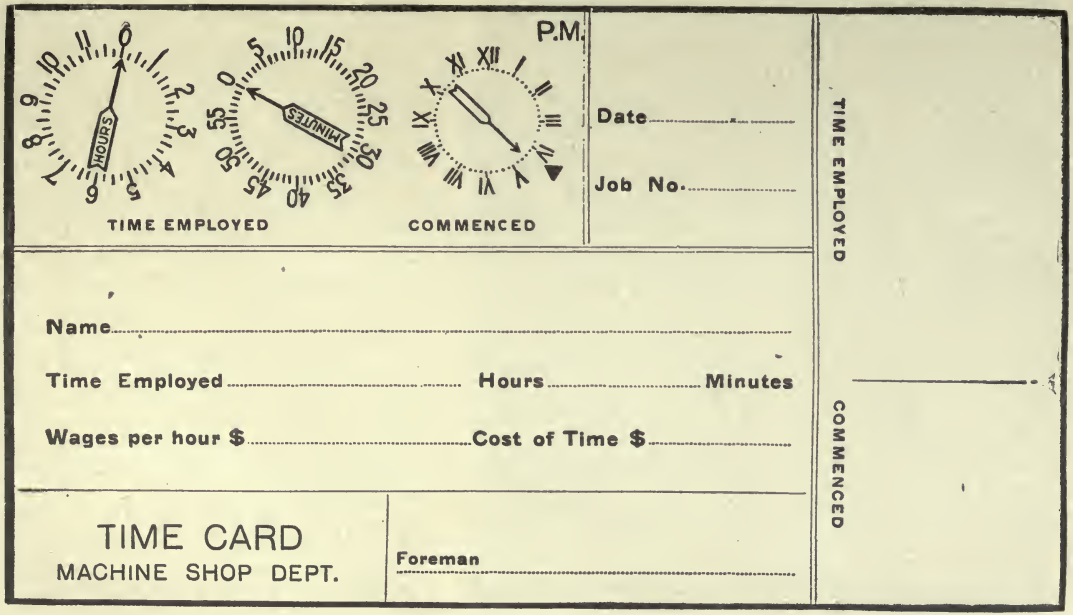

P.M.
HOURS
MINUTES
TIME EMPLOYED
COMMENCED
Date
Job No.
TIME EMPLOYED
COMMENCED
Name
Time Employed
Hours
Minutes
Wages per hour $
Cost of Time $
TIME CARD
MACHINE SHOP DEPT.
Foreman

FIGURE 22a

MORNING

| START | | | | | | | | | | | | STOP | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 6 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 7 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 7 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 8 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 8 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 9 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 9 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 10 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 10 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 11 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 11 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |

AFTERNOON

| START | | | | | | | | | | | | STOP | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 12 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 1 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 2 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 2 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 3 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 3 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 4 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 4 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 5 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 5 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |

FIGURE 23

be done in any case where it is not necessary to get out specific quantities of raw material, as in the case of a foundry.

A classification of the shop orders, after entry upon the records, will allow some very valuable facts to be ascertained by comparison. For instance: Suppose we assemble all shop orders calling for the production of a given unit during a certain period. Our comparisons show us (by means of a graphic chart, if desired) the amount of raw material used in this unit at various times and by various workmen. Any marked difference between the amounts used in various units shows something wrong which must be at once made a subject of

investigation. Direct labor charge on a given unit is also to be compared in the same way and any other variation investigated. Here is where the great possibility of economy will arise. This system of comparisons will at once point out and locate the leaks—the first step toward correction. When we find our lowest point in labor or raw material we must use it as a base and make it our constant aim to reach the same result in future operations.

A similar comparison of work tickets give us a very clear idea of the comparative value of our labor, as shown by results. Say we have 100 men working on the production of a certain unit. They need not necessarily be employed at the same time or on similar quantities, as we can easily reduce the time and production shown to a rate of "units per hour." A comparison will then show the comparative efficiency of all the men employed in the production of the unit in question.

When this comparison shows that one man produces only about one-half as much in an hour as another, it would seem that he was either a "soldier" or else that he was not given the right sort of work. If the first is the case, his record will be low, by comparison, on all classes of work and he is a fit subject for discharge. If he is merely misplaced it will show for itself—transfer him. A prime requisite for success in a factory is that the production must be kept up to a high average per capita of labor employed.

Fig. 22b. shows a shop order for use in a foundry. This order is made out in the usual course, the quantity wanted, name or number of casting, weight and piece price being filled in at the originating point. The molder then

Molder

Foundry Order

No.

| Make | Name of Piece | Weight | @ | Put up | Poured | Bad | Good | Inspector |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

FIGURE 22b

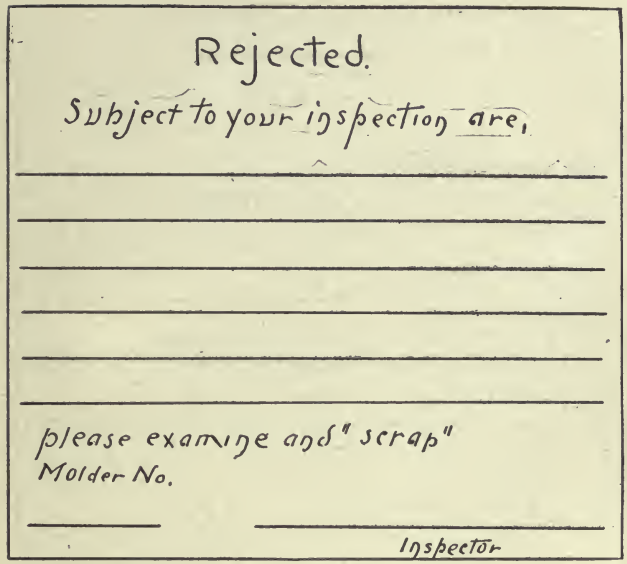



FIGURE 22c

fills in the number of flasks put up, the number poured and the number of bad and good as shown on "shaking out."

The inspector or tally man O. K.'s this count when the castings are taken up by the truckers or carters to go to the cleaning room. Each molder places the casting's number and his own on each piece, thus making it possible to identify any given piece at any time.

The cleaners are given a small bonus for imperfect castings discovered which tends to make them careful in examining all pieces coming through their hands.

All imperfect castings are taken to what is known as the "discount" or "reject" room, there to await inspection on the part of the molder. Castings thrown out in clean-

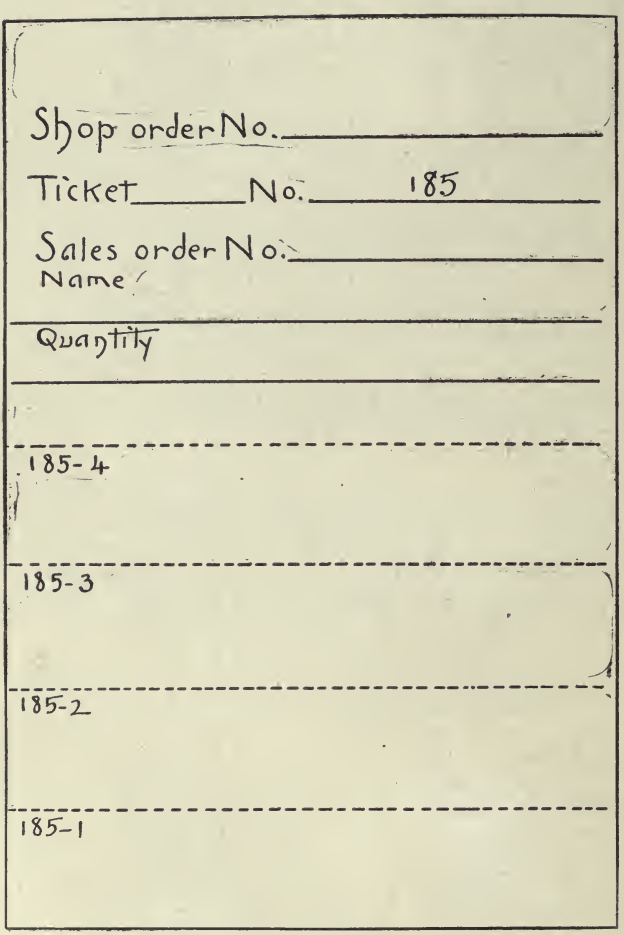

Shop order No.
Ticket No. 185
Sales order No.
Name
Quantity
185-4
185-3
185-2
185-1

FIGURE 25

ing or elsewhere are entered on this sheet in red ink, a corrected (red ink) entry being made as to the total "good" castings.

In order that there may be no dispute as to the correctness of the deduction a notice (Fig. 22c.) is sent to the molder, who is required to go to the "reject" room, examine and verify the rejected piece, when he is supposed to break it and put it in the "scrap" in order that it may not appear as a rejected piece a second time.

Fig. 25 is a ticket used as both shop order and work order in a factory using the piece work plan in the production of an article which passes through several hands in the course of its completion. This is made with perforated coupons or parts, if desired, and as many coupons are provided for as there may be separate operations in the process. Where the process is one which is often repeated the name of each operation is printed on a separate coupon beginning with No. 1—the last one.

This tag or order goes to the first operator who has to do with it accompanied by the raw material. If the work is to be paid for on a piece work basis the operator is provided with a rubber stamp bearing his or her name, and when the first operation is finished an impression of the rubber stamp is made on tag No. 1 and the partly finished product, with the order, passed on to the second operator, who in turn marks No. 2 tag with his or her name and so on to completion.

The coupons are perforated because it often is found that the end of a pay roll period has arrived, leaving some lots partly completed. Those operators who have finished their work naturally desire their pay, and it is simply necessary for the time-keeper to detach the "com-

plete" coupons for the pay roll record, leaving the "incomplete" to follow in due course.

If the pay is to be on a time work basis the coupons are stamped with a time recording device, using the starting time on each coupon as the closing time on the previous one, the last coupon recording the time the job was finished. This plan takes it for granted that the material passes from hand to hand without waits between.

When a mechanical device is used and the work tickets made a part of the pay roll it will naturally follow that the workman is paid only for work actually done. The weak spot in many systems, especially where day work is used, is the fact that there is no record of time elapsing between the complexion of one job and the beginning of the next. In a case of this character there is always a discrepancy between the actual amount paid out (as shown by the pay roll) for direct labor, and the amount charged to specific jobs and shop orders. This is wrong, in theory, at least. It should be the foreman's duty to see that no machine and no workman is idle through a lack of assigned work. When the work ticket is a part of the pay roll and no payment is made to the workman, except for time or piece work tickets, the workman will very naturally see to it that work enough is provided to keep him busy, that he may get paid for full time. When, through the foreman's fault, no work is provided, the workman is entitled to a ticket chargeable to "department non productive."

These tickets reflect directly upon the foreman's ability and naturally he is anxious to make a good record, so in actual practice he will have as few of them as may be.

A comprehensive shop order is shown in Fig. 24. This order is one used in the tin shop department of the Sherwin-Williams Co. of Cleveland, Ohio. This concern (which is a paint and varnish house) manufacture their own tin cans in immense quantities. The order shown comprises every feature of the shop order, material order, requisition and piece work tickets. The little coupon work tickets are perforated so that they may easily be detached by the foreman of the tin shop, to accompany the distribution of the raw material and partly completed cans as they pass from machine to machine. This order can be vivified merely by giving it a number and entering the stock number of the can to be manufactured and the number of pieces to be made on the order. By the use of a numbering machine the number given the shop order is repeated on the piece work tickets. While this order was gotten up specially for the institution in question, it can very readily be used in any factory which manufactures an article in considerable numbers, using a series of machines or a series of operations in the process.

In the case of this order it will be necessary when taking the order to the cost clerk to send with it the full number of coupons normally attached, that is 21. Any of the orders not used will, of course, be returned with the shop order in blank form. This particular form of shop order and work ticket provides for a record of the waste at each machine and also provides for a record of the solder used in each operation. The accuracy of the record as to waste is to be checked at the end of the operation, as the completed cans are stacked up in such a manner that each crate may be counted at a glance.

In some cases the work of getting out and cutting

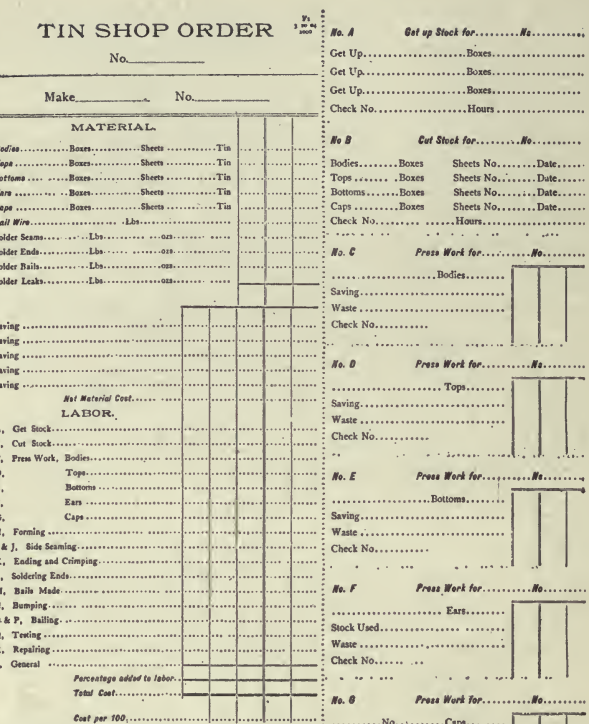



FIGURE 24

stock which is here recorded will be done on a day work instead of a piece work basis. In order to arrive at this cost accurately it will be necessary to keep together the stock tickets handled for one day, which will thus make it easy to apportion directly to the various jobs the actual cost of handling and cutting the raw material. This same plan will apply in many instances where one man

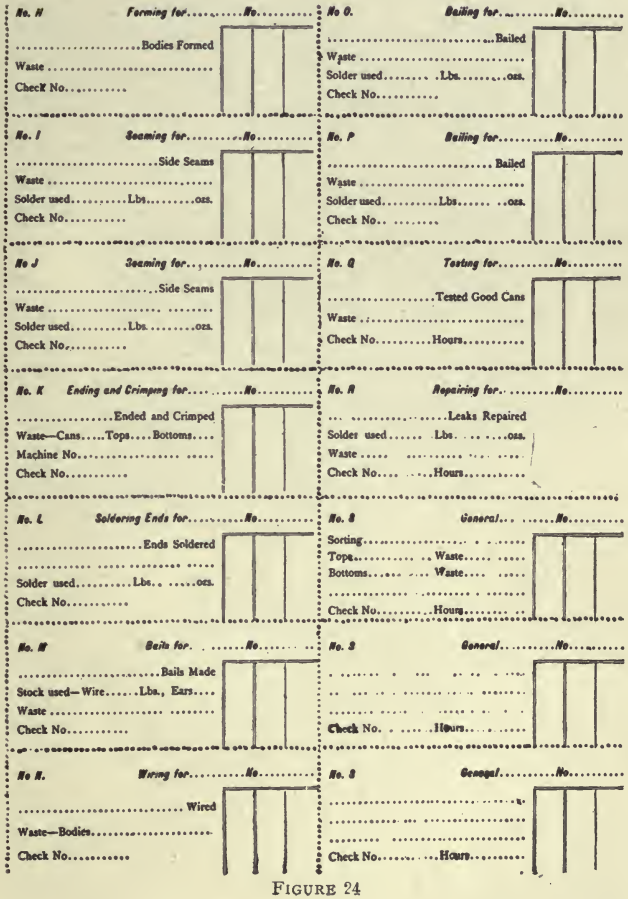

No. H Forming for.....No.....
.....Bodies Formed
Waste .....
Check No.....
No. I Seaming for.....No.....
.....Side Seams
Waste .....
Solder used.....Lbs.....ozs.
Check No.....
No. J Seaming for.....No.....
.....Side Seams
Waste .....
Solder used.....Lbs.....ozs.
Check No.....
No. K Ending and Crimping for.....No.....
.....Ended and Crimped
Waste—Cans....Tops....Bottoms....
Machine No.....
Check No.....
No. L Soldering Ends for.....No.....
.....Ends Soldered
Solder used.....Lbs.....ozs.
Check No.....
No. M Bails for.....No.....
.....Bails Made
Stock used—Wire.....Lbs., Ears....
Waste .....
Check No.....
No. N. Wiring for.....No.....
.....Wired
Waste—Bodies.....
Check No.....
No. O. Bailing for.....No.....
.....Bailed
Waste .....
Solder used.....Lbs.....ozs.
Check No.....
No. P Bailing for.....No.....
.....Bailed
Waste .....
Solder used.....Lbs.....ozs.
Check No.....
No. Q Testing for.....No.....
.....Tested Good Cans
Waste .....
Check No.....Hours.....
No. R Repairing for.....No.....
.....Leaks Repaired
Solder used.....Lbs.....ozs.
Waste .....
Check No.....Hours.....
No. S General.....No.....
Sorting.....
Tops.....Waste.....
Bottoms.....Waste.....
.....
Check No.....Hours.....
No. S General.....No.....
Check No.....Hours.....
No. S General.....No.....
.....
.....
.....
Check No.....Hours.....

FIGURE 24

usually handles all the stock or raw material for a department.

As they will be of interest, as illustrations of forms in use for the purpose, we here show the order forms used by the same concern—The Sherwin-Williams Co.—in the mixed paint department.

This is a production order—an order to make Formula No. 5—that is, formula or mixture No. 5, as shown in the formula records. The foreman of the department vivifies the order by filling in, from his records, the necessary amounts of raw material as designated by stock numbers. The stock is ordered by requisition (Form X2) in the usual manner. It will be noted that the space for recording raw material required is in duplicate—see the left hand column of Form X1. This is to allow for additions to the stated amount of raw material if it becomes necessary to vary from the original formula in order to produce results. Form X3 is the work card which is transferred from X1.

These forms are shown here as they are used, with modifications of course, in many classes of factories—candy factories, varnish works, bakeries; in fact, any factory making a standard article, using in its manufacture raw materials which will vary in proportion from time to time.

As previously stated, it will be found that vast amounts of information necessary on a shop order can be printed in the form requiring merely a check mark in some instances to make individual items operative. An illustration of this is shown in a printing office shop order gotten up by the Calculagraph Co. In this case it will be

*Slip No.*.....

# PASTE PAINT ℞

*Date*..... ℞ *No.* 5

*Name* .....

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| .....*Lbs*..... | *Lbs.* | *No.*..... | *at*..... | *per 100 lbs.* | ..... | ... |
| ..... " ..... | " | ..... " ..... | " | ..... | .... |
| ..... " ..... | " | ..... " ..... | " | ..... | .... |
| ..... " ..... | " | ..... " ..... | " | ..... | .... |
| ..... " ..... | " | ..... " ..... | " | ..... | .... |
| ..... " ..... | " | ..... " ..... | " | ..... | .... |
| ..... " ..... | " | ..... " ..... | " | ..... | .... |
| ..... " ..... | " | ..... " ..... | " | ..... | ... |
| ..... " ..... | " | ..... " ..... | " | ..... | ... |
| ..... " ..... | " | ..... " ..... | " | ..... | .... |
| .....*Galls*..... | *Galls.* | *No.* | " | *per 100 galls.* | ..... | .... |
| ..... " ..... | " | | " ..... | " | ..... | .... |
| ..... " ..... | " | | " ..... | " | ..... | .... |
| ..... " ..... | " | | " ..... | " | ..... | .... |
| ..... " ..... | " | | " ..... | " | ..... | .... |
| ..... " ..... | " | | " ..... | " | ..... | .... |
| ..... " ..... | " | | " ..... | " | ..... | .... |

*Batches*.....

*Total Lbs* .....

*Total hrs*.....@.... ...

*Mill No*.....*Dep't*.....

*Mat. per Batch*.....

*No. of Batches*_____

*Total Material*.....

*Gr'g Exp.*_____

$

*Bulk Cost per 100 Lbs*... .....

FIGURE X1

Order from.....

## REQUISITION FOR SUPPLIES

OK

Department..... Date.....

.....

.....

.....

.....

.....

Signed.....

NOTE—No orders for supplies will be recognized, except when made on these blanks and signed by the party making the same, and in every case the place where such supplies are needed must be specified.

FIGURE X2

| GRINDING ORDER | LIQUID FILLING ORDER |
|---|---|
| By _____ Slip _____ | By _____ Slip _____ |
| Mill _____ Date _____ | Mill _____ Date _____ |
| Fill _____ | Fill _____ |
| Overstock _____ | Overstock _____ |
| Signed _____ | Signed _____ |
| Remarks _____ | Remarks _____ |

FIGURE X3

noted that the total cost record was combined with the shop order. This, of course, can be altered if it is deemed advisable, as it usually will be, to keep the cost record and shop order separate. This form referred to is shown in Fig. 26. The details of the order are, of course, filled out when the order is entered. The items going to make up the cost as shown on the right hand side of the form are taken from work tickets, one of which is shown in Fig. 27. This work ticket needs merely a check mark opposite the particular operation printed in the ticket to become operative. The date, order number and workman's number or job number are, of course, filled in. The time the operation is commenced is shown in the right hand dial. The two dials shown on the left hand indicate the time used in performing the work in question. A description of the operation and the machine doing this work will be found in the chapter devoted to mechanical

RECORD OF JOB—No 520

Name Jones Smith & Co
Address 27 East 23d St
Date Ordered 4/30 Date Wanted 5/6
Ship to 14th St Store
Ship by Davis Express
Date Shipped 5/6
Description of Job Circular
7 x 10½
printed in 3 colors
2 up
No. of Copies Wanted 22 ~~700~~
Trim to Size 7 x 10½.
Color of Ink black-blue-red
Ruling Pads
Remarks

| | | |
|---|---|---|
| Stock 1400 sheets 28×42–80 Coated | 13 | 45 |
| Stock Spoiled 75 sheets | | 75 |
| Stock Over | | |
| Stock Used 1475 sheets | 14 | — |
| Estimated Price | | |
| Contract Price | 60. | — |
| Price Charged | 60. | — |
| Profit | 10 | 34 |
| Loss | | |

COST OF JOB

| | |
|---|---|
| Composition | 195 |
| Proofs | 25 |
| Reading | 10 |
| Corrections | 38 |
| Author's Alterations | 57 |
| Second Proofs | |
| Second Reading | |
| Make-Up | 48 |
| Imposition | 114 |
| Foundry | 38 |
| Making Ready | 145 |
| Press Waiting | 150 |
| Printing | 984 |
| Slip Sheeting | |
| Cutting | 2— |
| Folding | |
| Binding | |
| Packing | 150 |
| Shipping | 75 |
| Total Labor Cost | 2229 |
| Engraving | |
| Extra Expense | |
| Shop Expense | 1387 |
| Stock Used | 14— |
| Total Cost of Job | 4966 |

FIGURE 26

aids. If preferred, of course, the elapsed time may be computed in any way desired, using a time stamp or the device shown in Fig. 23, indicating in pencil the time used.

It will be necessary in this instance as in the others to see that work is provided in advance in order that the total payments of direct labor, as shown by the pay roll, may not exceed the total amount charged directly to various jobs as shown by the cost sheet.

In this printing house ticket, Fig. 27, it will be noted that one of the items is "Press Waiting." Where the press room foreman is ordered to get a press ready for a job he receives his order through the medium of one of

Date

Order No.

Dep't

Workman

TIME EMPLOYED — COMMENCED

| Operation | Hours | Min. @ | Per Hour | COST |
|---|---|---|---|---|
| Composition | | | | |
| Proof | | | | |
| Proof Reading | | | | |
| Corrections | | | | |
| Author's Alterations | | | | |
| 2d Proof | | | | |
| 2d Reading | | | | |
| Make-Up | | | | |
| Imposition | | | | |
| Foundry | | | | |
| Making Ready | | | | |
| Press Waiting | | | | |
| Printing | | | | |
| Slip-Sheeting | | | | |
| Cutting | | | | |
| Folding | | | | |
| Binding | | | | |
| Packing | | | | |
| Shipping | | | | |

FIGURE 27

these tickets and if the job does not get to hand at the proper time, thus necessitating idleness of a press the ticket will show the fact, as the press room foreman will turn in his ticket demanding a working ticket when the job is ready for the press. As before hinted, this will show just who is responsible for delays of this character and by locating the trouble will enable the management to prevent this delay and consequent loss without much difficulty. It will, of course, be realized that it is to the advantage of every manufacturing institution to keep their machines busy as large a portion of the time as possible.

## SECTION XIII.

### Continuous Process Factories.

IN factories of the second class, that is, continuous process factories, the process of securing costs is quite simple as a rule.

Take a flour mill, for instance. From a given quantity of raw material—wheat—the product is pretty nearly constant, if not quite so. We have then a given product (so much flour of each grade, so much bran, etc., etc.). This product has a certain value, governed by causes entirely separate from its cost. If only the one thing is produced—the products of wheat—the total expenditure for all purposes could be divided, proportionably to value, among the units of product, to show the cost per pound, barrel, or ton.

Where a second material or a second grade is handled it will usually be found that separate sets of machinery are employed on the separate products, and it is simply necessary to apportion the total expenditure between the two processes.

A flour mill is instanced here, but the case is the same with any factory in class two, whether it produces flour, paper or rope. If the process of manufacture is divided into departments it is quite easy to find the cost of the process in each department by the apportionment

of total expense to the various departments, and so arranging the pay roll that the labor in each department is recorded separately.

Certain factories find it inconvenient or impossible to figure costs except on total output, although it is convenient to know occasionally the total yield and prime cost of some particular lot of product obtained from some particular lot of raw material.

In a case of this sort occasional "test lots" are run. The machinery is cleared in such a manner that the line of separation between the regular output and the "test" is clearly seen and a careful record of labor cost is made covering the "test" alone. This gives a test cost and a record as to the product as well.

When a factory of the second class changes from one class of product to another or runs on the production of two classes or grades of product from separate machines or sets of machines, it will usually be found that the variation in cost is almost wholly in the cost of raw material used. The machine will produce about the same number of yards or pounds of a given article, whether the material used be cheap or otherwise, the same, or practically the same, amount of labor cost is incurred in either case, thus the "process cost" is constant and the only variable factor is the cost of raw material.

Where the foregoing is true, the problem of cost finding in factories of the second class is simply one of recording accurately the use of raw material by an accurate store room and requisition system.

In factories of this class the problem of waste is always present. In some cases it is possible to reduce the element of waste to a constant percentage and to insist

that this percentage be not exceeded. In other cases the very nature of the business makes it impossible to estimate the probable waste. Some manufacturing industries will be found to combine in themselves both classes—one and two. Take a machine works, for instance: If the works makes its own castings, the cupola is considered as in class two, while the castings themselves are handled as in class one. The casting costs are made up of the following elements:

Raw Material—Iron.

Labor.

Expense.

Each piece of casting of a certain sort uses a given weight of metal, which costs a given sum per pound. To arrive at this cost we have the usual factors to consider, but we have also a waste. When a molder runs an imperfect casting he, of course, is not paid for it, but there is a certain amount of incidental expense which has been incurred without return. This imperfect casting then must be returned to the cupola as "remelt" at the cost of the iron, as shown by the cupola report, *plus* the incidental expense incurred.

In the case of certain factories operated as branches from a central office, it is customary to charge all material, expense, etc., to each factory, crediting the factory with its product at a certain rate or percentage of profit when it is turned over to the central organization for sale. This is not correct or advisable. In the first place, the profit may or may not be too small. In either case the factory management gets credit for something with which he had nothing to do. It is improper practice to include in the factory's record anything not within the control

of the factory management. In the case above cited, the two plants (or more, as the case may be) should be considered as mere departments of the central organization. Their records should include only the items under the direct control of the factory manager. He is in control of the material and labor costs—hence his record should stand upon those items, eliminating any prospective profit. Theoretically, at least, he is not concerned with the profit inasmuch as he does not control the sale. He is required to keep within certain limits as to material and labor cost per unit of production. To show a cost above the limit, either in material or labor, requires an explanation at least. It is a presumptive evidence of failure. To cut the cost per unit below the limit is presumptive evidence of success and the factory manager may very well object to the introduction into his records of any element which he may not alter.

## SECTION XIV.

### Supplementary Operations.

WE have now provided for the records of labor and material cost on our manufactured product, but in certain instances still further manipulation is necessary, some of it chargeable to manufacture, other parts possibly to sales account.

Suppose that the various departments of our factory are producing individual units which combined go to produce a single unit of sale. Our cost has been ascertained upon each individual unit. We now desire the cost of the complete unit ready for sale. Suppose this complete unit to be composed of parts A., B., C. and D., to ascertain the complete cost we must take the combined cost of the parts, plus the cost of assembling or setting up.

To get these last we must establish a new department, issuing production orders to it as to any other department, recording these orders and issuing work tickets, etc., as previously shown.

This will possibly involve some slight modification of the shop order records which will suggest themselves.

#### PAINTING OR VARNISHING.

Where painting or varnishing of the complete unit is necessary, the paint shop will preferably be charged with its own expenditure, making it a separate depart-

ment, but the operation of painting or varnishing can be made the subject of a work order issued upon the authority of the shop order to the assembling department.

Suppose we have a furniture factory, for instance. We have in store a stock of necessary parts or pieces to make 100 dressers No. 1 A. An order is issued to the assembling room (cabinet shop) to set up 100 dressers No. 1 A. From stock is drawn on requisition enough parts or pieces to set up the required amount. Work orders attached to the shop order after the plan previously shown provide for each necessary operation.

Setting up.
Filling.
Dressing.
Varnishing.
Rubbing.
Crating, etc.

The time and material charged on these work orders are provided for just as in the original process of manufacture, as shown previously. Where the article to be assembled is repeated over and over again without variation, it will not be necessary to issue a requisition for material, but instead a standard cost of parts is established and recorded. Where this is done great care must be taken to prevent undue waste of supplies (such as screws, bolts, trimmings, etc).

The paint shop will draw supplies for finishing the work—the supplies being charged to the department if general or to jobs if the material is such as to be used by that particular job alone.

### PACKING.

As previously suggested, it will very frequently be

found that goods designed for various points will require varied amounts of expenditure in the way of work and material in preparing them for shipment. Very frequently carload shipments require much less expense in the way of crating and packing than shipments of a less quantity, and other conditions frequently exist as well. This being the case it is usually well to charge all expense of this character to the sales department in order that it may be distributed according to sales territory, showing the comparative cost of selling the goods in definite territories or by separate salesmen. As previously suggested all shipping department expense should in practically every instance be charged to the sales department.

GENERAL AND DEPARTMENTAL LABOR EXPENSE.

Your pay roll will be divided into departments and each department into sections where such an arrangement is possible. Where this plan is followed the various sections may be totaled separately, the amounts showing the labor expense for a given department. The men should be numbered so that the number itself will indicate departments thus: the men in department No. 1 will be numbered 101, 102, etc. In department 2 the men will be 201, 202, etc.

In case general labor is shifted about from one department to another a general time card may be used. One card is used for each man each day. This card provides (Fig. A) spaces for detailing each operation in which a man may possibly be engaged at various times. On this card is entered by the foreman or by the workman himself the number of hours worked in each department. This form can be used to advantage by enterprises

No.__

# TIME CARD

Name_____

Date_____ Rate____

| hrs | | | | a/c | # |
|---|---|---|---|---|---|
| | Tug "Sally" | | | | 1 |
| " | Docks factory | # | 1 | " | 2 |
| " | " " | # | 2 | " | 3 |
| " | Roads " | # | 1 | " | 4 |
| " | " " | # | 2 | " | 5 |
| " | Maintenance " | # | 1 | " | 6 |
| " | " " | # | 2 | " | 7 |
| " | " Office | | | " | 8 |
| " | Improvmts factory | # | 1 | " | 9 |
| " | " " | # | 2 | " | 10 |
| " | " Office | | | " | 11 |
| " | Loading factory | # | 1 | " | 12 |
| ____" | Unloading " | # | 2 | " | 13 |

____ hrs.

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Amt._____

O.K.

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FIGURE A

having scattered work which requires that accurate record be kept of just the amount of work devoted to each class or department.

Fig. A is made to represent the card applied to an establishment running a steamer, two factories, etc. Of course it is understood that the card for use by any concern would be made up to cover the departments necessary in its own system of distributing accounts.

### EXPENSE.

There is probably no question concerning cost keeping, which is so subject to debate as expense and its apportionment.

Raw material is easily kept track of—direct or productive labor is quite within control, but expense is an extremely variable quantity and its proper distribution is vital, if accurate cost figures are expected.

All expense falls under one of two classes, direct or indirect.

Direct expense embraces all expenditure which can be determined as having been made as a part of the cost of product of a certain class or a certain department.

Indirect expense is any expenditure made for the benefit of the organization as a whole and not particularly applicable to a single process or department.

While it is sometimes said that all expenditure is an expense, we will consider here only such items of expense as must of necessity be divided between two or more units of production or two or more classes of product.

As definite expense items we have for apportionment these:

Labor—Indirect.

Wages—Salaries.

Material—For general use, not assignable to departmental.

Expenditure—For intangible things, as charity, general legal advice.[1]

### A GENERAL BASIS OF APPORTIONMENT.

Given an item of expense to be apportioned among several departments, what is the proper basis of division? Some permanent basis must be determined upon and it is very important that that basis be one which will be just. Let us see.

If we consider the expense of the whole establishment for the period of a whole year, three methods present themselves: 1st, total expense divided among departments in proportion to direct "labor cost." 2nd, division according to cost of product. 3rd, division according to material used.

1st basis: a division proportioned upon labor cost (direct, or direct and departmental).

This method is applicable to cases where the labor cost in a department is fairly constant while the material cost in variable.

2nd basis: applicable where the reverse is the case—material constant in value, labor variable.

3rd basis: preferable where the labor and material costs are both constant in relation to one another.

No absolute rule can be laid down which will fit every case. The basis for use in each establishment must be determined upon a careful consideration of individual circumstances.

In isolated cases it is quite conceivable that expense might be apportioned among single machines or operations, or groups of either, in proportion to the plant space

occupied, but this would be in isolated cases only and by no means a general situation.

In distributing expense over departments no great difficulties are experienced as departmental expense is arrived at with comparative ease, but suppose we have a factory where work must be charged in jobs, the problem is not so simple.

Say we have a bench hand of some sort using tools of little value—perhaps his own—occupying but little room and no power. His labor rate may be high, say 50c per hour and his shop expense charge would be very low, possibly 50c per day. On the other hand we have a hand earning 25c per hour who operates a machine of high cost, using much power and occupying a large area of space. The shop expense charge in his case would be large.

Now say we have a job which takes one hour's time from each man above mentioned. This means 75c in direct labor, an easily ascertained amount in departmental indirect labor and a certain charge for shop expense. The question at once comes up: what shall we do in order to ascertain the "tool" cost in such fashion as to allow us to place upon the work card not only the labor cost but the tool cost as well?

We can ascertain the whole charge against one tool or machine for a given period of time and if the tool or machine is in constant, uninterrupted use apportionment will be easy, but in many cases it will be found that the use of the tool in question is intermittent.

In this case it is manifestly impossible to charge against the job in operation all the accumulated expense which has piled up against the tool since the close of its last operation.

In fact in certain instances it will be found that a certain tool or machine is kept in operation in a shop simply because it must be. No profit is or can be made on its output, but it is absolutely necessary that this be provided for in order to sell the other output of the factory.

When this point of view is taken it will be necessary to apportion the expense of all tools among the total product of the department in which they are used and in some cases within the writer's knowledge the expense charge against a tool or machine infrequently used is spread over the whole factory's output.

A tool room expense account is sometimes a charge against the whole factory output and sometimes a charge against one or two departments only; this must be made the subject of analysis in each individual case.

### CLASSIFICATION OF EXPENSE.

So far as possible every item of material purchased should be put into store and from thence removed on requisition charging it to specific jobs or departments thus reducing to the lowest point the amount which must finally be pro-rated over the entire output's cost.

Take the pay roll for instance; by careful analysis it will be possible to charge the majority of items on the roll to definite departments. Even though a given item of labor may not be directly productive, it is almost always possible to show that it is in some way definitely concerned in production and thus assign it to its proper place.

Keep down the general expense items to as small limits as may be. This account is usually made a "catch all" and many items are dumped into it which should have been specifically assigned. This means that the

burden was not placed where it should have been—some product assumed an expense not its own, showing false returns.

This may seem a small matter, but in the aggregate it is likely to be more important than one would suppose.

### EXECUTIVE EXPENSE.

The salaries and expenses of purely executive officers should be recorded separately from any other item. Of course it is sometimes the case that an undue amount is spent in the executive department when the executors are large stockholders, merely to divert a portion of the dividends which would otherwise find their way to the pocket of the small stockholder.

We are assuming here, however, that the sole aim of these records is economy, hence the recommendation as to separate record showing proportion of executive expense to other expense.

If the executive heads are sole owners they will not wish to place a seeming loss on manufacture by drawing large salaries, but will rather prefer that actual results be shown on an economical bases, their profit coming in dividends instead of salaries.

So important is this deemed in some quarters that in most states the law demands that this item be separately reported in statements furnished to insurance commissioners.

### TRAVELING EXPENSE.

Traveling expense is usually charged to either production or selling, but it will at times be necessary to charge certain traveling expenses to administrative expense when they are incurred by an executive head. An analysis of individual cases governs this.

### SALARIES.

In very many cases the salaries must be pro-rated over both departments and sometimes over three departments. Collectors and salesmen are, of course, chargeable directly to the selling department. The accounting force may be said to divide their time more or less equally between the two. Work, of course, performed on the purchase ledger and its auxiliaries would belong to the production department, while that performed on the sales and collection part of the work would belong to the sales and collection department exclusively. Some institutions charge the accounting department entirely to production but this is manifestly incorrect, as certain portions of the work in this department are employed in caring for sales. For instance, when a sale of product is made it is understood that a bill will be rendered, that certain correspondence will be entered into if necessary, and in due time drafts will be made, or other means taken to collect the price of the goods sold. All this work being a necessary part of the sale, it is naturally chargeable to the sales department. The cost clerk is, of course, a general expense item, also such an expense account as he might possibly have in the way of supplies, stationery, etc.

### POSTAGE.

Telegrams, telephone charges, messenger service and kindred items are charged usually under this head. Almost all messages, whether written, telephoned or telegraphed, are sent for one of two purposes, either to promote production or to promote sales. It naturally follows that the expense should be charged to the department for whose benefit it was incurred.

Many concerns provide an elaborate system for dis-

tributing these charges, taking account of each letter and charging the postage to the proper department. In these establishments stationery is as carefully recorded, being put into store and issued to departments upon requisition and charged just the same as material entering directly into production.

### POWER, LIGHT AND HEAT.

Power, light and heat, usually one department in a modern factory, are best carried in a separate account. Sometimes the quantity of light and heat used by the institution outside of the producing departments is so small as to be a negligible quantity, but if desired it can easily be pro-rated.

It will frequently be found necessary to make a careful study of the power problem before deciding upon the proportions of power expense to be borne by various departments. It may well be that one department whose output requires a very small outlay of power will produce output of a high value, using a high percentage of direct labor, while another department using a low percentage of labor will use a heavy outlay of power. Labor costs in the power department will be fairly constant and supplies should be fairly so,—any undue increase in either labor cost or use of supplies should be made the subject of investigation. Coal consumption should be closely watched and recorded from day to day as waste is more easy in the use of coal than in the case of almost any other item of expenditure.

It is usually customary to reduce the power expense to a horse-power unit basis and to estimate, as accurately as possible, the horse-power consumption of machines, processes or departments for the purpose of distribution of charges.

Where electrical power is used through the medium of individual motors, the determining of power used is quite simple.

### DISTRIBUTION.

To provide for the proper distribution of expense items is a most important matter—in some cases even more important than labor charges. In any case a faulty system—one which does not apportion the items accurately—is fatal to an accurate determination of costs. The ordinary distribution is accomplished through the medium of the columnar cash book but it is impossible to use this if the distribution is to be made in great detail. The writer has in mind a distribution sheet used in one institution which provides for 156 separate divisions of the expense account. To open such a number of accounts in the ledger would entail an amount of clerical labor not to be considered. In the sheet in question space is provided for the entry of amounts under proper heading, the amounts being taken from vouchers and the sheet being a daily one. Totals from this sheet were charged to department summaries on a summary sheet which carried totals for two weeks, that being the period covered by the pay roll. These items consisted of one store room entry and 155 department entries and the summary sheet became, of course, the record of indirect material and expense for each department during a given time.

### WASTE.

As all materials possible will be put into store and issued on requisition only, the item of waste is reduced to a minimum. Spoiled materials are charged to waste, a ticket being made on a regular form to be entered in expense records.

A piece of work spoiled in a certain department would be charged to that department and naturally include not only the raw material involved but the cost of labor as well.

Note—Insurance is, of course, an expense item, that on plant to be charged to production or with a small portion charged to sales while insurance on completed goods in store is charged to selling expense.

Some accountants recommend a voucher system for handling the records of factory payments and the various systems which have come under the writer's notice have many points to recommend them, but in some instances the system seems overdone, making a cumbersome system difficult to handle. There is no question that a voucher system provides a perfect check upon all payments and prevents any possible leakage of funds as well as for a distribution of items of expenditure but this last result can be attained by the use of a distribution record like Fig. B if preferred. This may be in the form of a rubber stamp if desired but perhaps a printed slip will be found preferable as the slip may be gummed on one corner only and attached to the face of the bill without obscuring any of the items which a rubber stamp would possibly do.

A printed list is usually furnished showing number and letter used in identifying the various departments recognized in the distribution of expense items.

The charge against machinery or departments for use of plant should be arranged on a rental basis. A number of mercantile and manufacturing concerns are adopting the plan of placing a department manager in absolute charge of a productive department and making

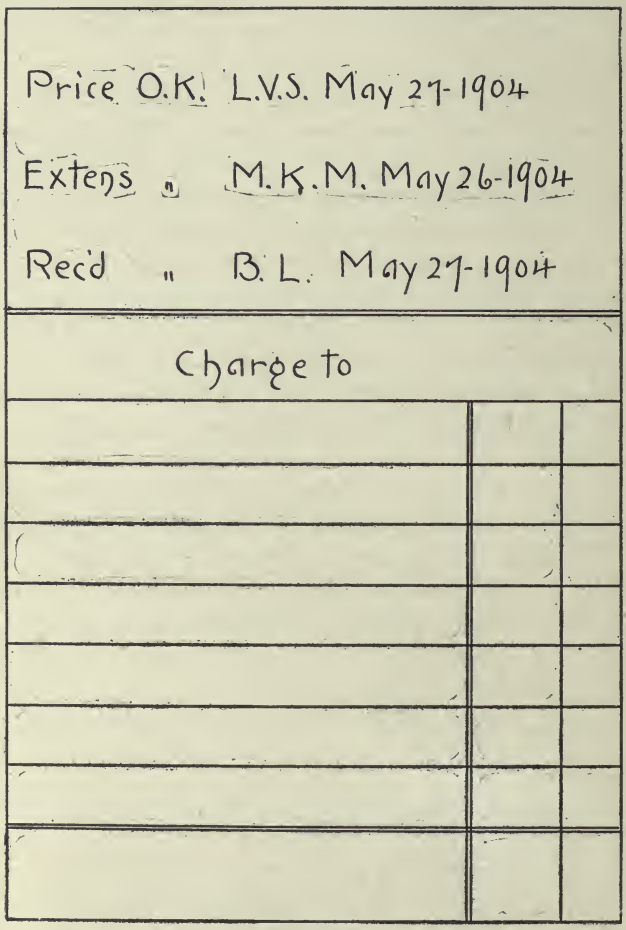
Price O.K. L.V.S. May 27-1904
Extens " M.K.M. May 26-1904
Rec'd " B.L. May 27-1904
Charge to

FIGURE B

him absolutely responsible for its successful running, making his salary contingent upon the amount his costs could be made to show below a certain basic figure.

If it is deemed advisable to keep a separate account with each machine or group of machines the account would embrace:

Dr.

Rent for space.
Capital actually invested in each machine or group.
Charge per horse-power for power consumed.
Repairs to each machine or group.
Labor.

Cr.

Product.

Where a number of machines are operated, turning out a product identical in character, it is, of course, well to arrange the records so that comparative product can be shown from day to day or from week to week.

There sometimes arises a question as to the method of charging repairs because if repairs are charged directly to the department calling for them and the expense placed at once it will make the output for a given period bear more than its share of the expense and thus show a false cost—too high at a certain point and too low at all others.

To obviate this an account may be opened with "Repairs" (not renewals) and the amount charged to the whole year's production (or even a greater period) either by departments or as a whole just as may seem advisable. Of course it will be necessary to make estimates as to repairs to be expected during the current year, basing the estimates upon the past experience of the concern and readjusting upon a basis of actualities.

The following plan has been suggested for use where the columnar cash book is not considered available or where the distribution is so varied as to render it inadvisable to open ledger accounts with each expense division. The plan contemplates the use of only one column in the cash book under the head of expense, or—if preferred—the cash book may still be columnar to suit the convenience of the accounting department, but for the purpose of making accurate apportionment of expenses among units of production the division is made by means of a subsidiary book or sheet the footings of which would balance the expense columns of the cash book during any given period.

The book or sheets in question, which we will call our Expense Distribution Journal, may be used in either of two ways; first, to provide for entries made in vertical columns, each column headed with the proper departmental description. This would mean that two or more sheets would be used each day if the departmental distribution reached any large number of divisions; or second, to provide for a line for each department, having as many lines on a page as there are departments. See Fig. C and Fig. D.

The columnar cash book has one disadvantage not noted heretofore, in that it does not bring expenditures up-to-date if it is considered that all expense should be charged when it is incurred, not when it is paid.

By the use of these sheets or books the expense account can be kept up-to-date so far as productive costs are concerned while allowing the accounting department to pursue its usual course.

All purchases should be charged to the store room whenever possible to be taken from thence on requisitions.

Expense Distribution.

Week Ending_____190_

| Department | No. | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|---|
| Power | 1 | | | | | | |
| Postage Sales | 2 | | | | | | |
| " Prod. | 3 | | | | | | |
| " Adm. | 4 | | | | | | |
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FIGURE C

Expense Distribution.

| Date | Voucher No. | Power | Postage | Insurance | Admin'n | Sales | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
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FIGURE D

If all stores are thus treated it will very greatly reduce the number of departmental entries in the journal and will be found of advantage in many ways.

A column is—of course—provided in the journal for entering stores and all stores are at once charged in the expense column of the cash book. There are a few instances where a purchase of stores by a manufacturing institution could not be called expense in a strict interpretation of the term but in most instances it will be found that all purchases can be so cared for.

Bad debts—uncollectible accounts—are an expense, but are chargeable to the sales department alone.

Where a royalty is paid on a process or upon some item of production its amount is charged directly to output as a special expense. If the royalty is paid for the mere right to make use of a certain process, the total amount of the royalty is spread over the total product resulting from the use of the process, making proper allowance for a possible depreciation or falling short of estimated production.

Suppose a patent is purchased which has a life of twenty years. The common method would be to divide this into twenty parts charging one part to production, under the patent, each year for twenty years. This time should be reduced, however, by an allowance for depreciation as explained later.

A question was put to the writer not very long since as to what part of a factory's output should bear legal expenses of various sorts. Legal expenses can usually be divided just as are other expense items—that is, they belong either to production or sales as analysis may show in each individual case.

Defense of patents, copyrights, or trade-mark is

chargeable to production and would usually be charged to the cost of the total estimated production of the patented article. There is another form of legal expense which is not so clear in its classification—that is, expenses of such a sort as are incurred in times of labor troubles, such as prosecutions for illegal combination—application for injunction, etc. These expenses and others of the same sort (such as extra watchmen and extra expenses of all sorts made necessary by the peculiar conditions prevailing) would seem to be chargeable to the establishment as a whole rather than to any special department, as they are really a fight to maintain the integrity of the establishment as a separate entity. This would indicate that all such items should go to general expense.

There is a certain class of manufacturing institutions which have as a part of their production a by-product of more or less salable character. It is sometimes the custom to consider the revenue arising from the sale of such by-product as "found money" and to credit it on the cost of departmental production.

This custom is explained by the statement that the by-product should properly be considered as waste—in other words a given amount of raw material was used to produce a certain quantity of finished product, the total cost of such raw material being charged to the product and thus any salvage should properly be credited to the product in question, serving to reduce its cost.

Usage varies in regard to this but it would seem that the above would usually be the correct procedure. Take, for instance, the case of a works of any character producing large quantities of cinder or ash in its power department. Under ordinary circumstances to dispose of the cinder would be an item of expense—that expense

would naturally be added to the other items going to make up the cost of power. Now suppose that circumstances arose which made this cinder saleable. It would seem no more than just that the revenue from that source be applied to a reduction of the total cost of power unless the case was an exceptional one—that is, unless the sale of by-product was one which would probably cease in the near future.

In modern blast furnace practice all power is derived from furnace gases, reducing the cost of power to the mere labor outlay and repairs and depreciation charges.

Gas works sometimes produce by-products to an amount which will cover the entire operating expense, but in this case it is immaterial as to where the revenue is applied as total expense is spread over total product for any given period without a division into departments. Where a strict departmental division is made it will be necessary to determine just where such possible revenue should be applied if there should be such revenue. In a wood working plant there is usually more or less salvage on lumber account which salvage will be pro-rated over all production using lumber as a raw material.

A lumber mill will usually produce enough waste to supply fuel for its own power production with a surplus to be otherwise disposed of. In many localities it is customary to provide a "burner" or furnace to destroy this surplus and get it out of the way. In some localities only the saw-dust, bark and small waste are burned under the boilers, the larger waste being sold as fuel. In a case of this sort it is clear that salvage must be used to reduce the cost of power production but in this case it will probably be found that the salvage will not reduce the power cost to a point below the costs shown by the mill to whom

the waste is an expense because a market for the waste implies a location where plant value—ground rental, etc.—will be enough higher to offset salvage.

This question of by-product becomes a serious one because of the fact that the discovery of ways of utilizing waste products has changed many an unprofitable investment into a money maker.

It will perhaps seem to some that too much stress is laid upon a proper apportionment of expense, but experience will show that upon the absolutely correct carrying out of this division in detail depends the absolute exactness of cost records which is the aim of all cost systems.

The "old fashioned" way was to get each item approximately and then "estimate" the balance with wide margins to provide against possible error. Labor cost, especially direct labor cost, was gotten quite accurately. Indirect labor cost was not quite so easily arrived at—and here the "estimate" began to get in its fine work. When it came to expense the estimator was in his glory for all was "guess work." No disastrous results followed so long as profits were high enough to take care of mistakes but when the time of stress came it was frequently found that costs were merely "averaged." Some products were bearing all the burden, others none at all.

An "estimate" of costs is a dangerous thing—insist on facts—they will almost always be producible.

### LEGITIMATE ESTIMATES.

Certain estimates are legitimate and not to be done away with—estimates on cost of future work for instance. To a very great extent these estimates will become merely a promise, based upon past performance as shown by the accumulated records. If the necessary records have not

been accumulated—then estimate in the good old fashioned way—and keep a record of the performance. This will not only check up your estimate but will provide a history for your future guidance.

### DEPRECIATION.

In general terms depreciation may be defined as the loss entailed on an item in possession through the passage of time, through use, through accident, or through progress and development of process or through recent invention making obsolete an article (machine—process—pattern—building or what not) in use.

This article does not contemplate a decline in value of stocks, bonds or other investment as a depreciation nor does it take into consideration any appreciation of plant or property through a rise in value.

Land on which a plant is built may, of course, rise or decline as the case may be and strict justice will demand that a revaluation will be made, from time to time, of the inventory value of land.

It may safely be assumed that plant buildings will always be subject to some depreciation. Just how much will depend upon circumstances, such as location and character of buildings, etc., etc.

There are two ways of providing for depreciation; one of them is to charge off each year a sum sufficient to cover the estimated loss by depreciation; the other, to provide a "sinking fund" or redemption fund which will grow rapidly enough to provide for the replacement of the equipment at the expiration of its period of efficiency.

It is sometimes claimed that a part, at least, of the equipment of a manufacturing plant is not subject to depreciation—that a machine, for instance, if kept in per-

fect order by the necessary repairs does not lose its efficiency. The writer recently visited a blast furnace making charcoal iron, where the blowing engine in use had been in constant service for over 60 years and was still at work—ample for the needs of the furnace. This was instanced as an argument against a depreciation charge, but the comparative efficiency of the plant was overlooked. No cost system was maintained, and while it is true that the furnace made money, it is also true that the profit was made *in spite* of the obsolete equipment and because of other favorable surroundings.

One possible circumstance should not be overlooked —that is, the possibility of the machine being rendered obsolete by the march of improvement.

A case in point relative to depreciation on machinery which has been kept at its highest state of efficiency by frequent and ample repairs is that of a flour mill which came under the writer's observation some years since. The mill had been in operation for many years, and was in as good condition at the time the writer speaks of as it was the day it was constructed, possibly in better condition. Improvements had been made from time to time which added to the value of the plant, as above stated, made constantly, which were charged to the expense account and which kept the entire plant, as above stated, in as good condition as the day it was put up. Viewing it from one standpoint any system of accounting which would have written off any of the original investment in plant on account of improvements would have been making a false showing, for leaving aside the increased value of the real property, the plant would have sold for more money at the time spoken of than its actual cost, as shown by the original books.

One curious fact in connection with this instance is that the framework of the mill had been built from very heavy timber practically without the use of nails, being fastened together with wooden pegs. In the course of years the timber appreciated greatly in value. At the time the structure was erected the timber was of little or no value, and as a matter of fact a lot of this timber had been burned in order to get it out of the way and get the land under cultivation, but, as above stated, in the course of years the supply of this timber decreased to such an extent that instead of being worth nothing, it was worth $100 a thousand feet, and when the old structure was torn down the contractor made a small fortune out of the sale of the old timbers. This mill then could truly be said to be worth more than it had ever been in its history. A very short space of time made a complete change of circumstances. The old mill was equipped, as were all mills at that time, with machinery for manufacturing flour by the old stone process. The invention and rapid adoption of the roller process in a very short period of time drove the old stone process flour out of the market, because of its inferiority in color, etc. Soon there was no market for flour manufactured by the old process, and as a consequence the machinery which had a short time previous been worth the full price originally paid, it became little more than so much waste material, and as a matter of fact it required almost the same amount to re-furnish the old mill with new machinery as it would cost to erect a new mill and install new machinery, and as a matter of fact the latter course was pursued and the mill was reconstructed, even to the buildings themselves.

This simply illustrated the fact that it is absolutely necessary in figuring the depreciation to take into account the progress of improvement, which in the course of time will render useless any kind of machinery, no matter how carefully it may have been maintained in its original state of availability.

The depreciation of patents is always heaviest toward the close of their term of life because one of two cases will always be true. Either the patent will grow less valuable as time goes on or inventive genius will find a substitute if it or its use grows increasingly valuable.

In either case the major portion of the total cost of the patent or process should be borne by its earlier years when its value is greatest.

## SECTION XV.

### Mechanical Devices.

ANY reference to modern factory procedure is necessarily incomplete without a reference to the most important of the mechanical aids which can be used to very materially reduce the cost of clerk hire in record systems.

Computations of various sorts are a large portion of the departmental work of many factories and mechanical computers have made many things possible which were impracticable if not impossible in the way of compilation of comparative statements.

An instance of wonderful development along these lines is the electric tabulator used in our recent U. S. census. Calculating machines have been used for many years—as a matter of fact the Chinese used such a device long before the Christian era. In our day there are hundreds of mechanical calculators, good and poor, cheap and expensive. The trouble has been heretofore that the cheap ones were not good and the good ones were not cheap. The first device to overcome these objections is

THE BEACH CALCULATING MACHINE.

FIG. E.

This machine performs all the functions of a mechanical calculator, including addition, subtraction, di-

vision, multiplication, etc., and is an invaluable aid to the accountant or cost clerk who must necessarily collect a multitude of scattered items to form a total. Its price—

FIGURE E

$50.00—puts it within the reach of many who have considered the price of other machines—$150.00 to $500.00—prohibitive.

Its keys may be operated simultaneously or in succession as desired and the space over which the hand must travel is very small, thus making it exceptionally rapid in operation.

One feature—peculiar to it—is a locking device. It is provided with a key, a quarter turn of which locks the machine, fixing all the parts in an immovable position. The key may then be removed and the machine is thus secure from any possible careless interference which would disturb the result already attained.

By means of this locking device the operator may leave a computation partly finished and resume it at his leisure with no fear of any outside interference with his results.

The construction of the "Beach" is very simple and the working parts are few, rendering it almost immune from disarrangement.

After a computation is performed a half turn of the lever at the right returns all indicators to zero, putting the machine into shape for a fresh computation.

Made and sold by

THE BOOK-KEEPER PUBLISHING CO., LTD.,
Detroit, Mich.

Price, $50.00.

FIGURE F

THE CALCULAGRAPH.

This device has a varied use in cost keeping systems and occupies a place of its own which is filled by no other device.

By its use it is possible, without computation of any

kind, to record the time elapsed on any job. The work is recorded by means of cards. When a job is given a workman the card is placed in the machine and a single forward and backward motion of the lever on the right prints "time of day" and the two blank dials shown in Fig. G. This records starting time.

When the particular job in question is completed the same card is again inserted in the machine and a single motion of the left hand lever prints the two arrows or pointers in the blank dial. These two dials and their pointers now indicate the time which has elapsed since the card was first inserted in the machine.

In this case no hours and no minutes have elapsed as the second operation immediately followed the first. Any number of operations may be conducted simultaneously

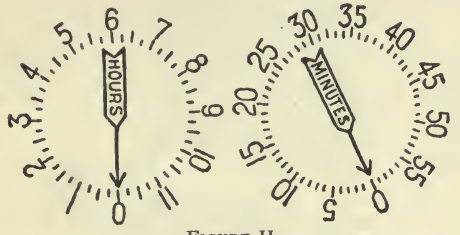



FIGURE H

FIGURE G

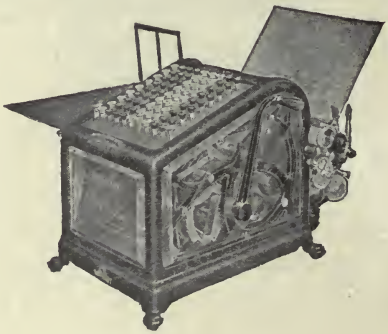
without confusion, the correct elapsed time being recorded in each instance.

This device is made by the Calculagraph Co., Maiden Lane, N. Y.

FIGURE I

THE COMPTOMETER.

A popular calculating machine—key-operated—showing results on a series of dials. Made by Felt & Torrant, Chicago. See Fig. I.



THE ARITHMOMETER.

A high-priced calculating machine which makes a printed record of addition, etc. Being lever-operated its speed is somewhat limited but for certain purposes it is of great value. Made by the Arithmometer Co., St. Louis, Mo.

FIGURE J

BATES NUMBERING MACHINE.

This machine prints consecutive, duplicate or repetitive numbers as may be desired. Of great convenience in numbering orders, requisitions, etc. Made by Bates Manufacturing Co., Chambers St., New York. See Fig. J.

AUTOMATIC TIME STAMP.

For recording time on workmen's cards or on any paper or document. May be used as a gate keeper's time clock by the use of cards which may be autographic or

otherwise as desired. Fig. K shows machine. Fig. L shows the style of record. Made by the Automatic Time Stamp Co., Boston, Mass.

### TIME CLOCKS.

For registering the time of arrival or departure of men from the factory or works some sort of a time clock

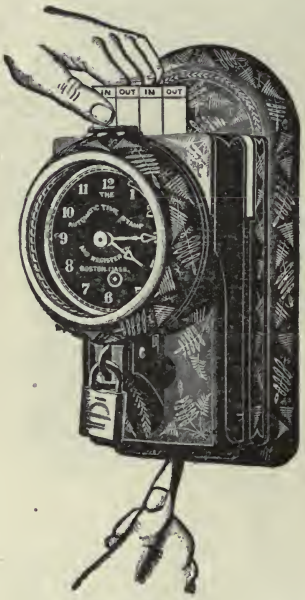



FIGURE K

FIGURE L

is advisable as the record made is automatic and much less liable to error than the most carefully made record

FIGURE M

which depends upon personal entries. The best of these time recording devices are of three styles:

1. Those stamping time on an inserted card.
2. Those marking time on a tape or dial.
3. Those marking time by means of a graphic chart.

Clocks of the first and second classes are made by the International Time Recorder Co., Binghamton, Mass.

In their clock of the first class the record is made by inserting in a slot in the base of the clock (Fig. M) a

Week ending, Jany 27 1898

No. 239

Name.

Henry Gordon

| DAY | | IN | LOST TIME OUT | LOST TIME IN | OUT | TOTAL |
|---|---|---|---|---|---|---|
| M | A. M. | 6 57/58/59 | | | 12 00/1 | 5 |
| | P. M. | 12 55/56 | | | 6 1/2 | 5 |
| T | A. M. | 6 58/59 | | | 12 4/5 | 5 |
| | P. M. | 12 57/58/59 | | | 6 10/11 | 5 |
| W | A. M. | 6 57/58 | | | 12 5/6 | 5 |
| | P. M. | 12 58/59 | | | 3 29/30 | 2½ |
| T | A. M. | 6 52/53 | | | 12 2/3 | 5 |
| | P. M. | 12 50/51 | | | 6 7/8 | 5 |
| F | A. M. | 7 30/31 | | | 12 3/4 | 4½ |
| | P. M. | | | | | |
| S | A. M. | 6 56/57 | | | 12 5/6 | 5 |
| | P. M. | 1 1/2 | | | 6 8/9 | 5 |
| S | A. M. | | | | | |
| | P. M. | | | | | |

*Total Time,* 52 *hrs.*

*Rate* 1.00

*Total wages for week, $* 1.50

FIGURE N

card (Fig. N) previously prepared to show the workman's name and number. The movement of a lever makes the time record. Cases for these cards are provided in duplicate (Fig. M) one set on each side of the clock.

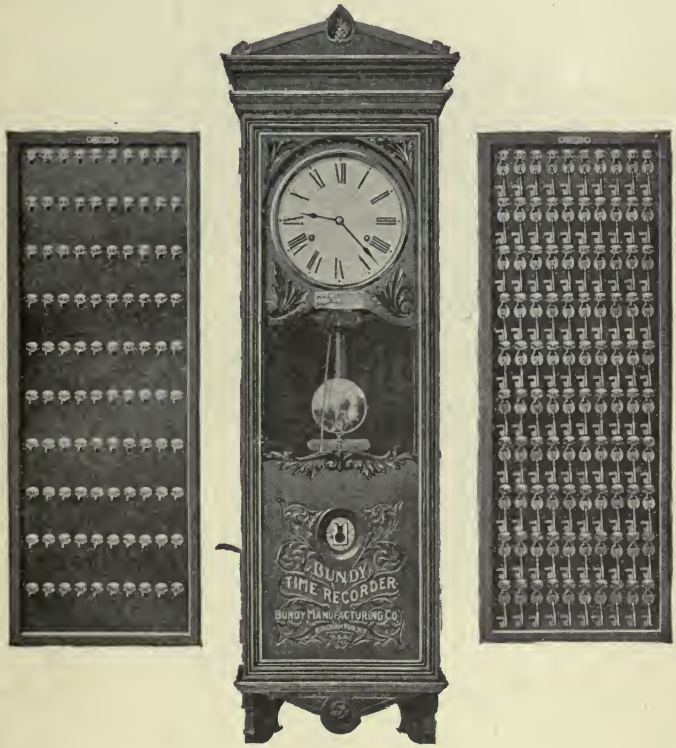
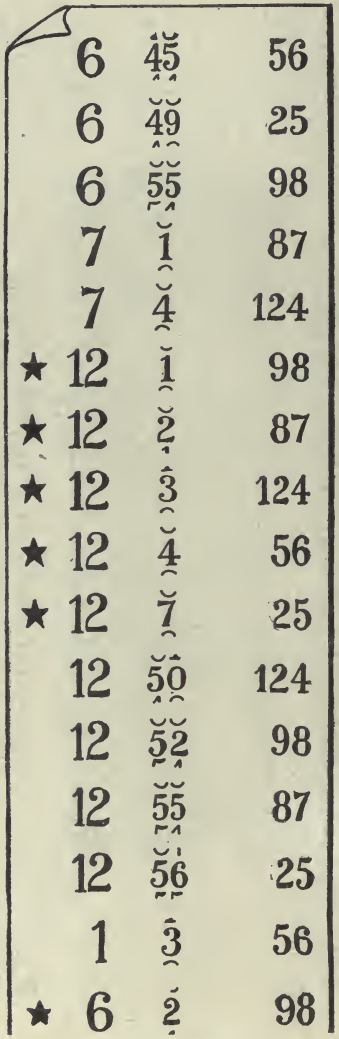



FIGURE O

On coming into the shop the workman takes his card from the "out" case at the left, rings up his time and deposits his card in the proper pocket in the "in" case



| | | | |
|---|---|---|---|
| | 6 | 45 | 56 |
| | 6 | 49 | 25 |
| | 6 | 55 | 98 |
| | 7 | 1 | 87 |
| | 7 | 4 | 124 |
| ★ | 12 | 1 | 98 |
| ★ | 12 | 2 | 87 |
| ★ | 12 | 3 | 124 |
| ★ | 12 | 4 | 56 |
| ★ | 12 | 7 | 25 |
| | 12 | 50 | 124 |
| | 12 | 52 | 98 |
| | 12 | 55 | 87 |
| | 12 | 56 | 25 |
| | 1 | 3 | 56 |
| ★ | 6 | 2 | 98 |

FIGURE P

on the right. The capacity of this clock is limited only by the number of cases or card racks provided.

Their clock of the second class provides racks on each side of the clock for "in" and "out" records (Fig. O). These racks hold keys instead of cards, one key being

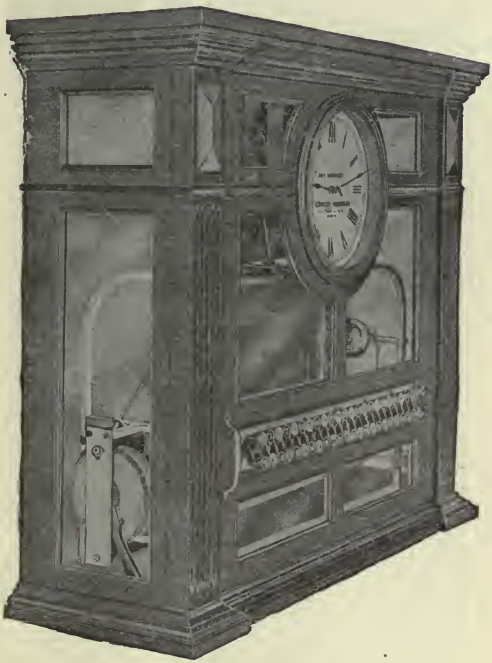


FIGURE Q

provided for each employe. The key is inserted in the clock and given a turn when it produces on a tape or strip of paper a record as shown in Fig. P.

The capacity of this clock is limited by the number of keys provided.

A clock of the third class making a graphic chart is

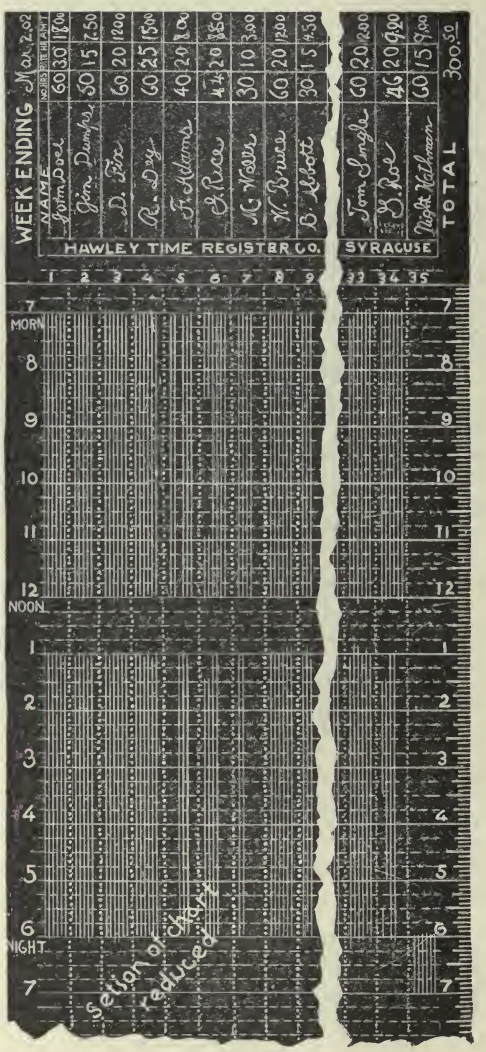

WEEK ENDING Mch. 2.02
NAME
HOURS RATE AMT
Tom Doré 60 30 18.00
Jim. Dumps 50 15 7.50
D. Finn 60 20 12.00
R. Day 60 25 15.00
F. Adams 40 20 8.00
A. Rice 44 20 8.80
A. Weber 30 10 3.00
W. Brown 60 20 12.00
B. Abbott 30 15 4.50
HAWLEY TIME REGISTER CO.
Tom Smyth 60 20 12.00
B. Roe 46 20 9.20
Mark Kellman 60 15 9.00
TOTAL 300.50
SYRACUSE
1 2 3 4 5 6 7 8 9
33 34 35
MORN
NOON
NIGHT
7 8 9 10 11 12 1 2 3 4 5 6 7
Section of Chart reduced

FIGURE R

made by the Hawley Time Recorder Co., Syracuse, N. Y. This clock (Fig. Q) carries a cylinder on which is placed a sheet of sensetized paper. "Ringing in" on the clock starts on this paper a continuous white line which is interrupted only when the number is "rung out." These lines, being black on white, are very legible, any break in the line denoting a break in time employed, the length of the break denoting the length of time missed. A glance shows the presence or absence at any time of any man and this without any computation. A reduced reproduction of the chart is shown in Fig. R.

It is usually customary to make some arrangement whereby an accurate record may be made of the continued

FIGURE S

service of employes whose duties are such that they must be left without oversight or supervision as night watchman, Sunday watchman, night furnace tenders, etc. For those whose duties confine them to one place the periodical ringing of a time clock will suffice but in the case of a watchman a record should be made which will prove conclusively that he has visited the various rooms or departments of the works at certain specified times. Many devices exist for making such a record as this, of which

one of the best is the Waggoner watchman's clock (Fig. S) made by the Waggoner Watchman Clock Co., Grand Rapids, Mich.

In this device a record is made on a sealed dial at a centrally located spot, of the exact time of registration at each station. These stations, which may be as many or few as desired, are located at various points about the building and grounds and so disposed as to make it necessary that the watchman cover every portion of the plant to reach them all.

As it will be of much interest in connection with this subject the writer reproduces here a monograph on Pay Roll Systems recently issued by Mr. W. W. Thorne, Fellow International Accountants' Society, F. A. A. S., etc.

## SECTION XVI.

### Time Record and Pay-Roll System by W. W. Thorne, Incorporated Accountant, London.

MANY different methods of arranging pay rolls have been devised with a view both of saving clerical work and obtaining a check on the accuracy of the pay roll.

Pay rolls are frequently complicated by the employes obtaining advances on their pay, and being charged with goods or supplies. In the days when book-keepers transferred everything into the journal prior to posting to the ledger, they also kept their pay roll accounts in the lengthiest and most roundabout way possible. From the pay roll they copied all the names of the employes into the journal, and having opened an individual account with each employe in the ledger, they proceeded to post to those accounts from the journal. Now any proper system used will provide for but two postings to ledger accounts, the charge of the total to ledger account and the credit to cash. The pay roll book itself is so arranged with a system of short leaves following the names pages that the names of the employes need be written only once in thirteen weeks, perhaps, instead of every week. Where the employes are charged with goods and cash advances, a combined pay roll and ledger is used, which is especially adapted to the requirements of plantations

Weekly Pay Roll

| Name | Salary | Clk. No. | January 5" | 12" | 19" | 26" | February 2" | 9" | 16" | 23" |
|---|---|---|---|---|---|---|---|---|---|---|
| W. Williams | 15 00 | 1 | 15 00 | 14 60 | 15 | 12 10 | 15 00 | 15 00 | | |
| D. Kerner | 6 00 | 2 | 6 00 | 6 00 | 6 00 | 6 00 | | | | |
| F. W. Cline | 20 00 | 3 | 20 00 | 17 50 | 20 | 20 | | | | |
| J. Arnold | 25 00 | 4 | 22 75 | 25 | 16 | 25 | | | | |
| | | 5 | | | | | | | | |
| | | 6 | | | | | | | | |
| | | 7 | | | | | | | | |
| | | 8 | | | | | | | | |
| | | 9 | | | | | | | | |
| | | 10 | | | | | | | | |
| Weekly Totals | | | 507 60 | 503 20 | 492 00 | 501 60 | | | | |

and lumber camps, where a general store is maintained and employes are paid by tickets representing the value of wages earned, which they can either exchange for cash at the company's office or for goods at the company's store.

Another labor-saving method is illustrated below, where the pay roll clerk simply takes account of time lost instead of time working, so that if a man works six full days with the exception of two hours on one day, it is only necessary to write the figure 2 on the pay roll instead of the figures 10 for five days in the week and the figure 8 on the sixth day when the time was lost. By the ordinary method twelve figures would be written in the pay roll book; by this method only one figure is written, a saving of eleven figures. If it is necessary to keep track of the time of two hundred employes, it is easy to see what a saving of time this method affords.

Each employe has a number and carries a check with the corresponding number. He is required to deposit the same in the morning before going to his post of duty in a box attached to the check-board, which is numbered from one up according to the number of employes. After the hour of commencement the time-keeper distributes these checks on the check-board and takes a record of all checks not on the board, which represents the employes not present. The board is then kept in the time-keeper's office until the noon hour for closing, when the same operations are gone through as in the morning. If for any reason an employe desires to leave before the regular time for closing he procures an order for his check from his respective foreman, stating the number of hours he has worked up to the time of his departure. This order is presented to the time-keeper, who delivers

FROM ... May. 8th ... TO ... May. 13th ... 189.9 ...

| NAME | M 8 | T 9 | W 10 | T 11 | F 12 | S 13 | Hours | | Price | Amount | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F. Jones | 10 | 0 | 10 | 10 | 10 | 10 | 5 | 0 | 6 | 3 | 00 | |
| | 10 | 10 | 10 | 10 | 10 | 2 | 5 | 2 | 5 | 2 | 60 | |
| | | | | | | | | | | | | |

FROM ... May. 8 ... TO ... May. 13 ... 189.9 ...

| NAME | M 8 | T 9 | W 10 | T 11 | F 12 | S 13 | Hours | | Price | Amount | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F. Jones | | 0 | | | | | 5 | 0 | 6 | 3 | 00 | |
| J. Smith | | | | | | 2 | 5 | 2 | 5 | 2 | 60 | |
| | | | | | | | | | | | | |

to the employe his check and makes a record of his time on the list above referred to. Each foreman is required to make a daily report of his employes who are absent, and this report is checked against the time-keeper's record. This forms a safeguard for errors. It also forms a complete record of employes not present and the balance of the employes on your pay roll must necessarily be present.

You are now ready to post to your time-book and here comes the economical feature of this system. You simply post the check numbers that were absent; those present taking care of themselves on the books, as you will discover later. In order that you may fully understand how this is done, I will give below an illustration of the method generally used by time-keepers, and one to the system to which I refer.

For illustration, if Mr. Jones in the above sketch, works ten hours the 8th, 10th, 11th, 12th and 13th, you will simply leave the spaces under those dates blank, and if on the 9th he was not working all day, you will place a cipher under that date. This would show that he worked 50 hours for the week ending May 13th.

The next man on the pay roll, J. Smith, works full time every day except the 13th, on which date he labors two hours. You enter the two hours under that date and leave the balance of the week blank; this shows a total for him for the week ending May 13th of 52 hours, and so on through the pay roll.

If there is piece-work to keep account of, this can be done by using the card system. Each person's account is kept on a card large enough to take in a pay day. Each card shall contain the name and check number of the person for whom the account is kept; this should be

Time Book and Pay Roll for the week ending Saturday August 26th. 1899

| No | Names | S | M | T | W | T | F | S | Total Time | Rate Per Day | Amount | Rent | Sundry Charges | Total Ch'gs | Balance Due | Rec'd Pay't in Full | No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Anderson A | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1 50 | 9 00 | | | | 9 00 | | 1 |
| 2 | Allington, G. | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1 50 | 9 00 | | | | 9 00 | | 2 |
| 3 | Baker, N. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 | 2 00 | 14 00 | 5 00 | ½ Ton Hay 3 00 | 10 00 | 4 00 | | 3 |
| 4 | Bowden, M. | | 1 | 0 | 1 | 1 | 1 | 1 | 5 | 1 50 | 7 50 | | Board 3 00 | 3 00 | 4 50 | | 4 |
| 5 | Boudree, Jos. | | 1 | 1 | 0 | 0 | 0 | ½ | 2½ | 1 50 | 3 75 | | | | 3 75 | | 5 |
| 6 | Corwin, F. | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 2 00 | 12 00 | 5 00 | | 5 00 | 7 00 | | 6 |
| 7 | Christianson, Ole | | 1 | 1 | 1 | 1½ | 1 | 1 | 6½ | 2 50 | 16 25 | | | | 16 25 | | 7 |
| 8 | Drace, M. | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1 75 | 10 50 | | | | 10 50 | | 8 |
| 9 | Deidrich, Geo. | | 1 | 1 | 0 | 1 | 1 | 1 | 5 | 1 50 | 7 50 | | | | 7 50 | | 9 |
| 10 | Durand, Thos. | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1 50 | 9 00 | | | | 9 00 | | 10 |

Time Book and Pay Roll f[illegible] 1st 26th. 1899

| No | Name | S | M | T | W | T | F | S | Total Time | Rec'd Pay't in Full | No |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Anderson, A. | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | ✓ | 1 |
| 2 | Allington, G. | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | ✓ | 2 |
| 3 | Baker, N. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 | ✓ | 3 |
| 4 | Bowden, M. | | 1 | 0 | 1 | 1 | 1 | 1 | 5 | ✓ | 4 |
| 5 | Boudree, Jos. | | 1 | 1 | 0 | 0 | 0 | ½ | 2½ | ✓ | 5 |
| 6 | Corwin, F. | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | ✓ | 6 |
| 7 | Christianson, Ole | | 1 | 1 | 1 | 1½ | 1 | 1 | 6½ | ✓ | 7 |
| 8 | Drace, M. | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | ✓ | 8 |
| 9 | Deidrich, Geo. | | 1 | 1 | 0 | 1 | 1 | 1 | 5 | ✓ | 9 |
| 10 | Durand, Thos. | | 1 | 1 | 1 | 1 | 1 | 1 | 6 | ✓ | 10 |

placed at the top of the card. The balance can be ruled or printed to meet the requirements of any business. These cards are filed numerically in a box or drawer suitable for the purpose, always keeping your live accounts only in this drawer. The total of each card is posted to the time-book every pay day; the cards are then filed away for further reference, and new ones started for the ensuing pay day.

Many pay roll books or sheets are arranged for signatures of employes, acknowledging receipt of wages paid. The disadvantage of this is that on signing the record each employe is in a position to see the rate of wages others are receiving, and this is frequently undesirable. While devices have been invented for the purpose of hiding all other entries on the pay roll except that of the employe signing it (see illustration), we think the best plan is to issue tickets to each employe, the tickets stating the amount of wages due and the instruction that on receipting same and presenting it to the cashier the amount will be paid. These receipts can then be filed away as vouchers or pasted on the pay roll book or sheet.

PAY ROLL SYSTEM FOR HARDWARE MANUFACTURING COMPANY.

The following method of handling the labor account of a large manufacturing concern, will perhaps be of interest.

The company is engaged in the manufacture of builders' hardware and employs about 300 men; the labor is subdivided into departments, beginning at the pattern department, and ending with the packing and shipping department, each having a foreman, who, in addi-

tion to their other duties, keep the time of the men in their respective departments. The foreman reports the time to the time-keeper wice a week, Thursdays and Saturdays, on slips specially ruled for this purpose (see Form No. 1).. These slips are written up by the time-keeper on a specially ruled book (see Form No. 2), the letters D and J after the names of the workmen indicate whether the work is day or job.

IRON FOUNDRY

Roanoke Va. Mch 13 - 1899

Time Report for John Smith.

With The Virginia Hardware Mfg Co.

| Items | 3/13 | 3/14 | 3/15 |
|---|---|---|---|
| Time | 10 | 10 | 8 |
| "810 Caps & Shells 15s | 87 | 20 | 46 |
| "317 Latch & Key Bolts " | | | |
| " 32 Catches " | | | |
| " 16 Pully Frames " | | | |
| "8647½ Fronts & Strikes " | | | |
| " " Levers & Stops " | | | |
| " 860 Escutcheons " | | | |

D Durring Foreman

After the week's work is all entered up, prices put in, extensions and footings made, etc., the totals are entered in the pay roll ledger (see Form No. 3) with the parties' names and number of hours made. The job hours are entered in red ink and the day hours in black ink, thus readily showing the kind of work each man has done at a glance.

After the pay roll is completed, a recapitulation is made showing the amount of day and job work of each department, which should tally with the total footings of the pay roll, these summaries are entered in the back of the pay roll book in a condensed form (see Form No. 5); from this, very useful and important information is gathered. The comparative cost of each department is

readily seen, the percentage of day and job work is shown, the latter information being indispensable in figuring the cost on the product of the plant.

The company also runs a commissary department in connection with its business. Commissary checks are issued to the employes against their time, the checks used are small pieces of cardboard 3x5 inches (see Form No. 4), which are numbered consecutively. When a check is issued it is charged on a memorandum book and posted from there to the pay roll ledger in the column

IRON FOUNDRY Week ending Mch 18/99

| Names | Prices | M | T | W | T | F | S | Total | Amt |
|---|---|---|---|---|---|---|---|---|---|
| Jno Smith | | 10 | 10 | 9 | 10 | 10 | 10 | | |
| 840 Caps & Shells | 145 | 87 | 20 | 40 | 16 | 147 | | 316 | 458 |
| 347 Latch & K Bolts | 140 | 32 | | | | | 48 | 80 | 126 |
| 32 Catches | 135 | 16 | | | | | 62 | 78 | 105 |
| 16 Pulley Frames | 150 | | 64 | 8 | | | | 92 | 138 |
| 847 ½ Fronts & Stks | 145 | | 40 | 7 | 120 | | | 173 | 251 |
| " Levers & Stops | 147 | | | 32 | | | 46 | 78 | 115 |
| 860 Escutcheons | 162 | | | 40 | | | | 40 | 65 |
| | | | | | | | | | 1258 |
| Ben Davis D | 25 | 10 | 10 | 5 | x | 4 | 10 | 39 | |
| J | | | | 5 | 10 | 6 | | | |
| 347 Shells & Caps | 165 | | | 85 | 70 | 90 | | 345 | 569 |
| John Thompson D | 20 | 10 | 10 | x | 4 | 10 | 8 | 42 | |

FIGURE 2

marked "Deductions," other items advanced to help, such as cash, coal, etc., are also entered in this column. These several amounts deducted from the amount earned gives the net amount due.

After the pay roll is closed, the time-keeper next makes out a ticket for each man, showing the amount earned, deductions made, if any, and the net amount due him for the week. These tickets are put up in envelopes and turned over to the foremen to be distributed by them to the men in their departments.

The next step is to prepare for paying out the money. For this purpose they use manilla coin bags 3x4½ inches in size.

VIRGINIA HARDWARE MFG Cos. Pay Roll for week ending Mch. 18 - 199.

| Names | M | T | W | T | F | S | Job Hours | Day Hours | Price | Amt Day work | Amt. Job work | Total | Deductions | Net Amt. due |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

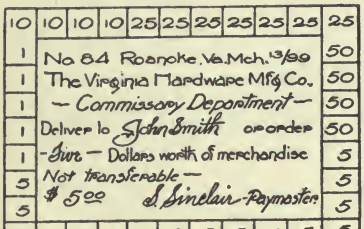
FIGURE 3

Summary of Pay Rolls From _____ to _____

| 1899 Week ending | Pattern Dept | | Iron Foundry | | Brass Foundry | | Pol. & Buffg. | | Machine. Dep. | | Assembling | | Total | | Per cent | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Day | Job | Day | Job | Day | Job | Day | Job | Day | Job | Day | Job | Day | Job | Day | Job |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

FIGURE 4

The name and amount is first plainly written on the upper end of the bag, the money is then counted out by the time-keeper and passed over with the coin bag to an assistant, who recounts it, puts it into the coin bag, and seals it up. After thus putting up the money, these bags are laid out on some suitable place in alphabetical order. When the hour for paying off arrives, the men assemble at the pay window of the time-keeper's office and present their tickets for payment. After comparison with the coin bag as to name and amount and getting it properly receipted, the money is passed out to the owner.


No 84 Roanoke, Va. Mch. 13/99
The Virginia Hardware Mfg Co.
— Commissary Department —
Deliver to John Smith or order
Five Dollars worth of merchandise
Not transferable —
$ 5.00
J. Sinclair Paymaster

After all of these tickets have been cashed, they are filed away in some convenient place for reference and as vouchers for the money paid out for labor.

By this method the men are paid off every Saturday evening, one week's wages being kept behind, as it takes this length of time to make up the pay roll.

The actual time consumed in paying off the men being about thirty minutes, this system was practically devised by the writer and used for several years with satisfactory results.—*S. S. Burch.*

PAY ROLL SYSTEM FOR A TANNERY.

It would be impractical for large concerns, having

many employes, to keep the account of every employe on the regular double entry ledger. At the same time a system must be kept by which any possible errors in employes can be avoided. The following is a system which is now being used by a large number of manufacturers, and although one may call it double entry, it is auxiliary to the regular set of double entry books. The system is comprised of only two extra or special books. One is the employes' time ledger, and the other is the coupon register. I will describe the former as follows: The pages are numbered in folio, that is, there is a right hand page and a left hand page for every twenty-five employes' accounts. (See cut No. 1.) At the left of the left hand pages are written the employes' names, usually in alphabetical order. The space to be given for each name should be about nine-sixteenths of an inch. A page ten by eighteen inches should hold twenty-five names or accounts. (The names are rewritten and new accounts opened with each employe every month.) The balance of the left hand page, to the right of the names, is ruled off into thirty-one spaces or columns, a column for each day of the month. Then each employe's space is subdivided into three spaces by horizontal lines of a different color. Into the top the time is entered. Into the two lower spaces the charges are entered.

Whenever a company store is operated in connection with other business, a coupon system is a simple method of charging employes up with what they may purchase in any one month at the store. Instead of charging up the employe's accounts with value of articles purchased, coupon books are issued to the employes in sums ranging from $2 to $20. These coupon books contain slips of

299 MELLEN TANNERY Month of May 1899

| Name | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Etc. to | 31 | No Days | Rate | Total Wages | Sunday Credits | Sunday Debits | Balance Due or to Credit | | When Paid | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | | | | | | | | | | | | | | | | 1 | |
| | 2 | | | | | | | | | | | | | | | | | | | | | | 2 | |
| | 3 | | | | | | | | | | | | | | | | | | | | | | 3 | |
| | 4 | | | | | | | | | | | | | | | | | | | | | | 4 | |
| | 5 | | | | | | | | | | | | | | | | | | | | | | 5 | |
| | 6 | | | | | | | | | | | | | | | | | | | | | | 6 | |
| | 7 | | | | | | | | | | | | | | | | | | | | | | 7 | |
| | 8 | | | | | | | | | | | | | | | | | | | | | | 8 | |
| | 9 | | | | | | | | | | | | | | | | | | | | | | 9 | |
| | Etc | | | | | | | | | | | | | | | | | | | | | | Etc | |

MELLEN TANNERY Month of May 1899 299

NOTE Red = black denotes credit; Red = red denotes debit

FIGURE 1

different denominations, which are good in trade only at the store. In each book is also a receipt which is torn out when book is issued, and the receipt is signed by the employe to whom the book is issued. (See form of receipt.) These receipts are then entered into the

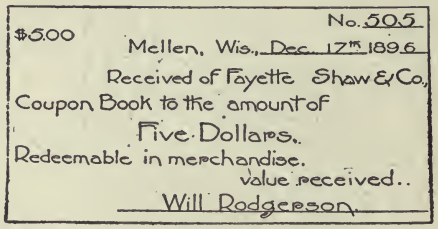



FIGURE 2

coupon register, ruled off as per cut herewith. From the coupon register the amount of coupons are posted to the employes' accounts in the time ledger, in red ink, to distinguish the coupon charges from other charges. After posting, check over all entries. In the journal, make an entry as follows:

Suppose that you have paid out on the same date, in cash, to different employes, amounts aggregating $93. Charge pay roll, in cash book, with that amount, and post to general ledger. Also enter on cash book, in the explanation column, the names of the employes who drew the cash, and the amounts. Post these from cash book to time ledger, in the column which is same date as entry on cash book. All cash charges on time ledger should be preceded by the letter C, and all journal charges by the letter J. The total charges in any one column in time ledger, on any given day, should correspond with total charged same day to pay roll in the cash book and journal.

300 COUPON REGISTER-MELLEN TANNERY

MONTH OF May 18

| Date | No of Book | Folio | To whom charged | Labor Account | Bank Account | Expense Account | Sundry Accounts | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Folio | Account | Ammount | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

FIGURE 3

The first money column of the right hand page is for wages. The second column is for sundry credits, or for balances carried forward from previous month. Into the third column are extended the total charges for the month. Into the fourth money column is carried the balance due each employe at end of month, after deducting all charges. The next column shows when balance was paid. If paid on the regular pay day, the initials "P. D." are inserted. If paid any other time, insert the date. The last column is for remarks, and into which should be noted how balance was disposed of. After the time is all entered on time ledger, and figured and carried out, then all charges should be extended into the charge column. Then carry out the balances into the balance column. Then add up the columns on the right hand page and prove as follows: Add the first column to the second column, then subtract the third column, and the remainder should correspond with the last or balance column. Then the footings of all the pages of the same month are grouped together on one page and added up, and proved again, as above.

The aggregate footings of the first column of any month constitute the pay roll for the month, and the footings of the last columns constitute the balance due employes on account of pay roll, and should correspond with the balance of pay roll account in the double-entry ledger. After pay roll is all complete divide up the different labor items, and make a journal entry, say as above.

PIECE WORK RECORD

| Date | | Name of Workman | Article | | Piece Work | | Day Work | | | Percentage Piece Work on Day Work | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Description | No. made | Cost per Article | Total Cost | Hrs. | Rate | Amt. | | |
| | | | | | | | | | | | |

PIECE WORK.

Where a piece work system is adopted, it is necessary to pay the strictest attention to the question of the output, as the workman is liable to sacrifice skill and careful attention to his work for rapidity of production in order to complete as large a number of articles as possible and so increase the amount of his remuneration. Those engaged on piece work are also liable to be careless with machinery, tools and material supplied, sacrificing everything to the end of securing a large output. Labor unions do not, as a rule, look upon piece work with favor, because the employer bases his rate for piece work on the amount of work performed by the strongest and most expert workman, thus rendering it impossible for the ordinary workman to gain a reasonable living.

Where both piece work and day work are employed in one establishment, it is useful to keep a record which shall allow of a comparison between the two methods, so that it can always be ascertained which is the most profitable method of manufacture of any given article.

HANDS PAY ROLL & LEDGER

| Name | No | Bal. forw'd. | Date | Debits | | | Date | Credits | | | Bal. forw'd. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Cash | Mdse. | Total | | Returns etc. | Wages | Total | |
| | | | | | | | | | | | |

### COMBINED PAY ROLL AND LEDGER.

Accounts with laborers form an important part of any system of accounting dealing with plantations. A combined pay roll and ledger should be adopted which will save all the trouble of keeping individual accounts with laborers, and at the same time prevent the writing of names oftener than once in about thirteen weeks instead of every week, as is customary on most pay rolls. A combined book of this kind is arranged on the tabular system as per the following illustration: The laborer is given by the superintendent a ticket each day for value of work done, and this ticket he can exchange for cash at the company's office, or for merchandise at the company's store. The book-keeper posts the debits from these tickets and files them away for reference. The superintendent keeps an account of all tickets issued and at the end of the week makes a return of the total wages earned by each man, duly O. K.'d, from which the book-keeper posts the wages credited to the pay roll and ledger.

The books should be ruled so that two weeks can go on left-hand pages and three weeks on right-hand pages. Then insert as many cut, or narrow leaves (without name and number columns) as may be considered practical, the books thus running for as many weeks as desired without rewriting the names.

(COST CARD—FIG. 3.) THE AMERICAN MANUFACTURING CO.

Name of employe..... No.....

| Shop Order | Material out | Time | Date finished | Quantity | Dept. | Material used | Prime cost | Labor | Sundries | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |

TIME RECORD SYSTEM FOR A FACTORY.

Each workman is furnished with a cost card (Fig. 3), on which he records particulars of time consumed and material used on the contract, or job, on which he is engaged. When the job is completed this card is turned in to the cost clerk, who figures on it the cost of material, labor and sundries and enters it on the Cost Record of Summary (Fig. 4). A separate page is alloted to each contract or job, and the total cost of same ascertained. This amount is then posted to the contract account in the ledger, which is credited with contract price, the difference being the amount of either loss or gain. Where certain staple articles are manufactured a comparative statement of cost of manufacture should be maintained, in order to ascertain that such costs are not excessive or exceptional in any way.

In Fig. 5 we show a form of Pay Roll Book, the particulars of which are obtained from the Time Recorder. If the Pay Roll Book is compared with the workmen's cost cards a very good check is obtained on the total time reported.

Some establishments still have their employes sign the pay roll, but where the hands are very numerous this is found laborious and inconvenient, besides exposing to the view of the person signing the amounts paid to others.

Fig. 6 shows a very good form of combined wages card and voucher, which can be used to advantage.

FIG. 4

## COST SUMMARY

| Date | Cost Card No. | Name of Workman | Dept. | Quantity | Prime Cost | Labor | Sundries | Folio | Total Cost |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

FIGURE 4

FIG. 5

## PAY ROLL BOOK

| Name | | M | T | W | Th | F | S | Total Time | Rate | Amount | Advanced | Balance due | | When Paid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | | | | | | | | | | 1 | |
| | 2 | | | | | | | | | | | | 2 | |
| | 3 | | | | | | | | | | | | 3 | |
| | 4 | | | | | | | | | | | | 4 | |
| | 5 | | | | | | | | | | | | 5 | |

FIGURE 5

(FIG. 6.) WAGE VOUCHER

THE AMERICAN MANUFACTURING CO.

CASHIER: ..... 1900

Pay to ..... the sum

of ..... in payment of wages due as follows:

Monday ..... hours
Tuesday .....
Wednesday .....
Thursday .....
Friday .....
Saturday .....
Total ..... hours

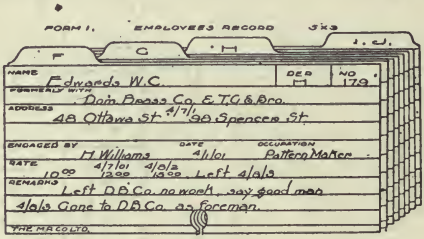
..... Supt.

RECEIVED of The American Manufacturing Co. the above amount in full of all claims this ..... day of ..... 1900

(Signature) .....

FACTORY TIME-KEEPING.

Where an employe is engaged an employes' record card (Form I.) is made out and filed away in an alphabetical index, he being instructed to notify the time clerk should he change his address. When any change occurs in his relation to the company it is noted on this card.


FORM 1. EMPLOYEE'S RECORD 3x5

F C H J. J.

NAME Edwards W.C. DEP H NO 179

FORMERLY WITH Dain Brass Co. E.T.C. & Bro.

ADDRESS 48 Ottawa St. 4/7/00 Spencer St.

ENGAGED BY H Williams DATE 4/1/01 OCCUPATION Pattern Maker

RATE 10.00 4/7/01 12.00 4/8/2 Left 4/8/2

REMARKS Left D.B.Co. no work, say good man

4/8/2 Gone to D.B.Co. as foreman.

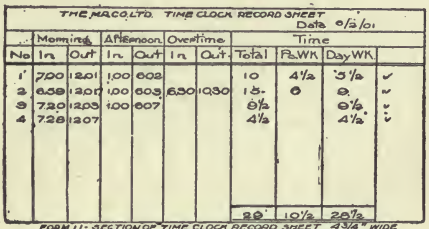
THE M.R.CO. LTD.

In the case of a former employe applying for a re-engagement, the information thus recorded will often be found of great value. In an emergency it is also frequently valuable to have easy access to the addresses of employes.

The time of all employes is recorded by themselves on entering and leaving the factory. For this purpose two register time clocks are provided, one for employes who are paid wages, and one for all others. On removing

the record sheets (Form II.) from the clocks in the morning, that for the salaried employes is simply placed on file for information of those to whom such employes are responsible.

On the record sheet from the other clock, the full amount of time as shown by the record is extended into the column headed total time. The amount of such time as has been spent on piece-work being ascertained from



THE MACO LTD. TIME CLOCK RECORD SHEET
Date 6/3/01

| No | Morning In | Morning Out | Afternoon In | Afternoon Out | Overtime In | Overtime Out | Time Total | Time P.&W.K. | Time Day W.K. | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7.00 | 12.01 | 1.00 | 6.02 | | | 10 | 4½ | 5½ | ✓ |
| 2 | 6.59 | 12.07 | 1.00 | 6.03 | 6.30 | 10.30 | 15 | 6 | 9 | ✓ |
| 3 | 7.20 | 12.03 | 1.00 | 6.07 | | | 8½ | | 8½ | ✓ |
| 4 | 7.28 | 12.07 | | | | | 4½ | | 4½ | ✓ |
| | | | | | | | 38 | 10½ | 27½ | |

FORM II. SECTION OF TIME CLOCK RECORD SHEET 4¾" WIDE LENGTH ACCORDING TO CAPACITY OF CLOCK

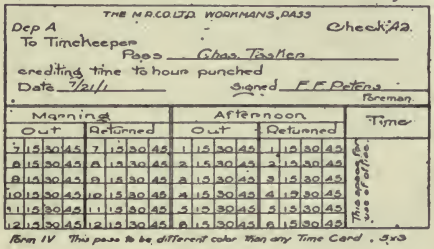
the factory clerk (as described later) is entered in the piece-work column, and the difference between the two extended into the column for day work. The time in this column is entered into the wages book (Form III.) each day, it having first been checked with the factory clerk's day-work tickets and daily time sheet in order to ascertain that all time credited to the workman has been charged out against some factory order. The total and piece-work time being added, the difference should, of course, correspond with the total of the outside or day-work column. If a workman is allowed to go out on his own business during working hours he is given a pass (Form IV.) by his foreman, indicating the time he stopped work. The door being so arranged that he has to pass the time-keeper's desk to leave the building, he gives his pass to the time-keeper and upon his return reports himself as

THE MALCOLM WAGES BOOK

Half Month Ending 31 January '01.

| No | Name | Shop Initials | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Total | Rate | Day Work | Piece Work | Total Wages | Remarks | Distribution by Shops | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | | | | Pattern | Machine | Tool | |
| 1 | Nelson | A | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 140 | 1s 9d | 2 8 00 | | 2 8 00 | Step Step | | | | |
| 2 | Wills H. | B | | | | | | | | | | | | | | | | | 60 | 1s 9d | 1 2 00 | 1 5 50 | 2 5 50 | Advance 9d | 2 8 00 | 2 5 50 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |

he passes in. The time he has been out is noted on his pass, and is deducted from the time passed to his credit through the wages book for that day. If he goes out on the firm's business he is given an outward time card indicating the time he leaves the shop, and having the number of the order upon which his work outside is required. This he leaves with the time-keeper. On his return he receives


THE M.P.CO.LTD. WORKMANS PASS

Dep A — Check 42.

To Timekeeper

Pass Chas. Taylor

crediting time to hour punched

Date 7/2/11 — Signed F.F. Peters Foreman.

| Morning | | | | | | | | Afternoon | | | | | | | | Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Out | | | | Returned | | | | Out | | | | Returned | | | | |
| 7 | 15 | 30 | 45 | 7 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | |
| 8 | 15 | 30 | 45 | 8 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | |
| 9 | 15 | 30 | 45 | 9 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | |
| 10 | 15 | 30 | 45 | 10 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | |
| 11 | 15 | 30 | 45 | 11 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | |
| 12 | 15 | 30 | 45 | 12 | 15 | 30 | 45 | 6 | 15 | 30 | 45 | 6 | 15 | 30 | 42 | |

This space for use of office.

Form IV This pass to be different color than any Time Card . 3x5

this card, which he returns to his foreman in the usual course. The time-keeper thus has either a pass or an outwork time card in his possession for each workman during absence from the shop. It will be seen that every alternate page of the wages book is a flyleaf; this enables one writing of workmen's names to suffice for two half months.

The keystone of factory accounting is a rigid adherence to the rule that no work shall be put in hand, expenditure incurred or goods or material delivered without written authority emanating from the office, and that all papers and records referring to or recording such work, expenditure, or delivery, must bear the number of the order authorizing the same.

On receipt of card from factory clerk and material from stores, the foreman of the department puts the order in hand at once. He issues a time card (Form

THE M.R.CO.LTD. DAY WORK TIME CARD

Check _____ Dept. _____ Order No. _____
Nature of work _____
Date _____ Signed _____
Overtime began _____ Finished _____

| Morning | | | | | | | | Afternoon | | | | | | | | Rate per Hr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Began | | | | Finished | | | | Began | | | | Finished | | | | |
| 7 | 15 | 30 | 45 | 8 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | Time |
| 8 | 15 | 30 | 45 | 9 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | |
| 9 | 15 | 30 | 45 | 10 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | Value |
| 10 | 15 | 30 | 45 | 11 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | |
| 11 | 15 | 30 | 45 | 12 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | 6 | 15 | 30 | 45 | |
| 12 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | 6 | 15 | 30 | 45 | 7 | 15 | 30 | 45 | |

This space for Office use

FORM XXI DOFF PAPER

THE M.R.CO.LTD. P.C. WORK TIME CARD

Check _____ Dept. _____ Order No. _____
Nature of work _____
Date _____ Signed _____

| Morning | | | | | | | | Afternoon | | | | | | | | Ft. WK Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Began | | | | Finished | | | | Began | | | | Finished | | | | |
| 7 | 15 | 30 | 45 | 8 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | Time |
| 8 | 15 | 30 | 45 | 9 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | |
| 9 | 15 | 30 | 45 | 10 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | |
| 10 | 15 | 30 | 45 | 11 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | |
| 11 | 15 | 30 | 45 | 12 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | 6 | 15 | 30 | 45 | |
| 12 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | 6 | 15 | 30 | 45 | 7 | 15 | 30 | 45 | |

This space for Office use

FORM XXII GREEN PAPER

THE M.R.CO. PREMIUM TIME CARD

Check _____ Dept. _____ Order No. _____
Operation _____
TIME ALLOWED FOR ABOVE IS _____ HRS. A PREMIUM OF _____ ¢ PER HOUR WILL BE PAID FOR EACH HOUR SAVED ON THIS JOB
Date _____ Signed _____

| Morning | | | | | | | | Afternoon | | | | | | | | Rate per hour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Began | | | | Finished | | | | Began | | | | Finished | | | | |
| 7 | 15 | 30 | 45 | 8 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | Time |
| 8 | 15 | 30 | 45 | 9 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | |
| 9 | 15 | 30 | 45 | 10 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | Value |
| 10 | 15 | 30 | 45 | 11 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | |
| 11 | 15 | 30 | 45 | 12 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | 6 | 15 | 30 | 45 | Premium |
| 12 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | 6 | 15 | 30 | 45 | 7 | 15 | 30 | 45 | |

This space for Office use

FORM XXIII RED PAPER

THE M'R CO LTD OUTWORK TIME CARD

Check _____ Dept. _____ Order No. _____
To Time Keeper - Retain this card until workmans' return
Order _____
Address _____
Date _____ Signed _____

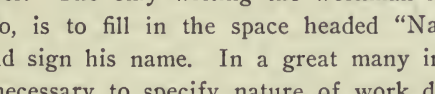
| Morning | | | | | | | | Afternoon | | | | | | | | Rate per hour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Out | | | | Returned | | | | Out | | | | Returned | | | | |
| 7 | 15 | 30 | 45 | 7 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | 1 | 15 | 30 | 45 | Time |
| 8 | 15 | 30 | 45 | 8 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | 2 | 15 | 30 | 45 | |
| 9 | 15 | 30 | 45 | 9 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | 3 | 15 | 30 | 45 | Value |
| 10 | 15 | 30 | 45 | 10 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | 4 | 15 | 30 | 45 | |
| 11 | 15 | 30 | 45 | 11 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | 5 | 15 | 30 | 45 | |
| 12 | 15 | 30 | 45 | 12 | 15 | 30 | 45 | 6 | 15 | 30 | 45 | 6 | 15 | 30 | 45 | |

This space for Office use

FORM XXIV YELLOW PAPER

XXI. to XXIV.) to the workman to whom he allots the job, first noting thereon the order number and the date. With his private punch he indicates the hour at which work is begun on the order in question. When the workman finishes the operation, or is put upon another job, he returns the card to the foreman. The latter punches the time at which work was stopped on that particular order. The only writing the workman is called upon to do, is to fill in the space headed "Nature of Work," and sign his name. In a great many instances it is not necessary to specify nature of work done, as, particularly in the manufacture of stock, the workman's name is sufficient to indicate to the office staff the nature of the work done by him.

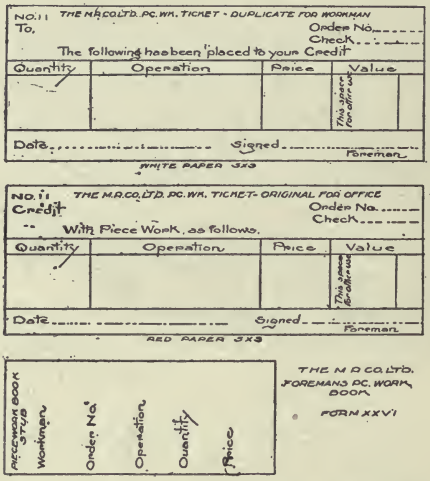
The time cards in possession of the foreman are of four kinds, each of a distinctive color, namely, day-work, piece-work, premium-work, and out-work. The rul-


THE H & CO LTD DAILY TIME SHEET.
Date.....
1 2
1¾ 80.
4 60.
3 60
1¾ 170
6¼ DW
Sheets of as large size as convenient and enough in quantity to furnish one space for each employee. Employees number is put at top of space and as time cards are printed, hours and value are filled in by Factory Clerk. Pc. Work Time being entered in red ink and totals checked with Cost Records
FORM XXV

ing is practically the same on all cards, and as far as both workman and foreman are concerned, no more clerical work is necessitated by one than the other.

On the premium time card the foreman fills in the time allowed, and with that exception the cards are treated exactly the same. It will be seen that all responsibility for the correctness of his time card is off the workman, and put where it properly belongs—on the fore-

man of the department. The latter is responsible for the time card bearing the correct number, and showing the actual amount of time expended upon that number. Under no circumstances is the workman allowed to begin




another job until he has returned to the foreman the card previously used by him and obtained another with his starting time for that job punched upon it. If a man is taken off a job and goes back again to work on the same, he gets a new card each time.

The back of the cards may be used for any remarks either the workman or foreman may wish to put on record concerning either the work done or time expended.

As regards the premium time card, the system of paying wages commonly called the "premium plan," may require a little explanation. To those interested in the question, and desiring to study the plan in the light of actual recorded results, I would recommend a number of

articles under the heading "Premium Plan," which appeared in The American Machinist at different times during the past two years. Briefly put, the idea of the plan is, after ascertaining from past records how long it has taken to produce a given article, or complete a given operation, to offer the workman a premium or additional wage upon such time as he can save on the same work. If past records show that certain work has been repeatedly done in ten hours, it is clear that if the workman can be induced to do the same work, or produce the same quantity in say, nine hours, a saving has been effected, and the idea is to allow the workman to share in that saving. Suppose the employe is to be paid at the rate of 20 cents per hour, if he is offered, say one-third of that amount for each hour saved, he will see that his employer's interests and his own are identical. It is really offering the workman that most powerful of all inducements to increase his output, namely, self-interest. Those who have had long experience with this plan claim it is the only system whereby increased wages to the workman mean reduced costs to the employer.

From time to time during the day the checks returned to the foreman are collected by the factory clerk. From time punched he calculates the time expended and, filling in the workman's rate per hour, extends it into space for value. On piece-work cards he simply marks the time expended and does not extend any value. The cards are kept sorted by workman's number, and entered on the daily time sheets (Form XXV.). These sheets are ruled into convenient spaces to hold for each man a record of his time as shown by his time cards, and the value of such portion of time as was expended on day-work. The piece-work time being entered in the same space in red ink, it is

a simple matter to keep the two from confusion. The last cards for the day are taken up by the foreman at 15 minutes before closing time, and by him punched and sent to the factory clerk.

The first thing in the morning the factory clerk takes the time cards and time sheets, and gives the time-keeper the amount of piece-work time for each workman. This is entered upon the clock record, and deducted from the total time as previously described. All day-work credited to any employe has now been accounted for under some factory order number.

As regards piece-work, except in very large shops, it is quite practicable to pay a workman for all piece-work done up to pay day, instead of following the usual plan of paying him a certain proportion, usually two-thirds of his day-work rate, and carrying the balance over to next pay. Each foreman is supplied with a piece-work book (Form XXVI.). On the stub he takes a memo for his own information. Both original and duplicate in this book are perforated, and as the work is inspected and passed as correct, the foreman removes them both from his book, and gives the duplicate to the workman. The original, which is of a different color, goes to the office and is extended and posted to the cost sheet. These piece-work slips are kept sorted by workmans' number until after the next pay day, when they are made up and posted to the credit of the workman; they are then sorted by order number and are filed away with other papers connected with the same order. It will be noted that while original and duplicate contain the same information, the printed matter is entirely different, so by no possible means can the duplicate be used to draw pay the second time, for work done.

At first sight it would appear as though the system of a different time card for each job would result in so many papers that the records would be too bulky to be quickly and accurately handled. If it were necessary to leave the collecting, sorting, pricing, and extending of all time cards until the close of the day it might be found so. Collecting them frequently during the day and keeping them sorted by workman's number and priced and extended, it should only take a very short time to check them with the clock records the next morning. This having been done, the tickets should be sorted according to order number, and it will then be found that they can be posted to the cost sheets in less time, and much more accurately than if several numbers were on one card. Besides putting the responsibility for the proper order number and correct time upon the foreman, the system of a single ticket for each order takes from the workman all opportunity to either "cook" his time, or enter as day-work time which he has actually spent upon piece-work, so getting paid twice for his labor.

No. 1 Month Mch 20 1900

Name W. Morris Mark X

| Price | Branch No. | | | | | | | Section No. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 ¢ | ½ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 0 |
| 50 ¢ | ½ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 0 |

No. 1 Month March 1900.

Name W. Morris

The figures punched show you the number of trees you have cut to-day

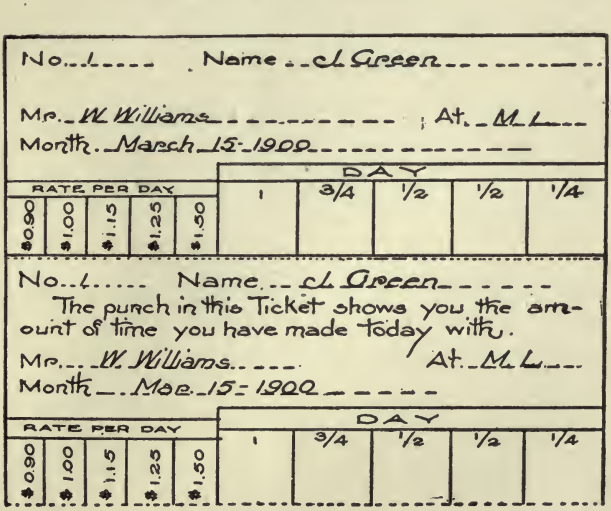
Counted by H. Jones Mark X

| Price | Branch No. 12 | | | | | | | Section No. 84 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 ¢ | ½ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 0 |
| 50 ¢ | ½ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 0 |

PAY ROLL SYSTEM FOR A LUMBER CORPORATION.

The laborers are employed in different ways, sometimes spending part of a day in one department and the remainder in another. They also obtain advances of cash, and purchase merchandise at the camp store. It is necessary, therefore, to have a special pay roll book, or, as it is called, a "Hands Ledger," an illustration of which will be found under the heading of Pay Roll. Each workman is furnished with duplicate tickets—one for each department in which he works. On this ticket the foreman punches the time occupied on the job, so that the laborer is always in a position to check up the settlement of his account by the time-keeper. We append samples of these duplicate tickets.

The original of these tickets go to the time-keeper, from which he makes up his records.


No. 1 Name C. Green
Mr. W. Williams At. M L
Month. March 15 1900
DAY
RATE PER DAY
$0.90 $1.00 $1.15 $1.25 $1.50
1 3/4 1/2 1/2 1/4
No. 1 Name C. Green
The punch in this Ticket shows you the amount of time you have made today with.
Mr. W. Williams At. M L
Month Mar. 15 1900
DAY
RATE PER DAY
$0.90 $1.00 $1.15 $1.25 $1.50
1 3/4 1/2 1/2 1/4

PAY ROLL SYSTEM FOR A MINING CORPORATION.

The company employs about 1,200 to 1,500 natives and 60 to 70 Americans, the latter being foremen, mechanics, clerks and heads of departments. The pay roll accounts for the natives are kept by the Tienda de Raya (meaning a store where merchandise is advanced against time tickets). The Tienda de Raya conducts also what is called a Prestimo office (cashier's or pay office), where labor time-keepers and Prestimo cashier are employed. It also conducts several branch stores which, however, are cash stores. All merchandise invoices and freights for the Tienda are charged to it direct when paid, as also all cash advanced it for use in the Prestimo office. At the end of the quarter the Tienda de Raya is charged with administration expenses and accrued profits. The Tienda schedules its pay rolls in what might be termed a distribution journal, showing amount of each class of labor chargeable for the month to each mine, each department or each account. This book when written up at close of month is turned in to the general office, when Tienda de Raya receives credit for total amount of pay rolls, also for the personal accounts of American employes.

At the close of the month a pay roll is made up in the general office for all American and salaried employes. There being no banking facilities whatever here, these employes leave the balance of their earnings with the company, each one has an account and is furnished with a pass book. Employes having balances are permitted to draw cash at will during the month, and all are allowed store accounts. These cash items (including checks and drafts) are debited in detail during the month, and at

the close of the month the various accounts are charged with their respective store accounts and credited with salaries.

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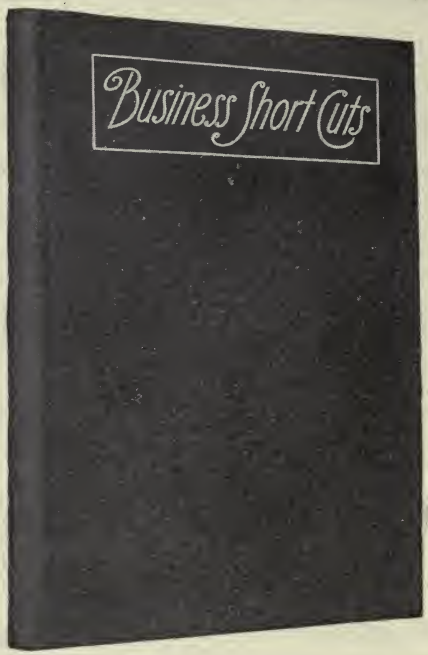


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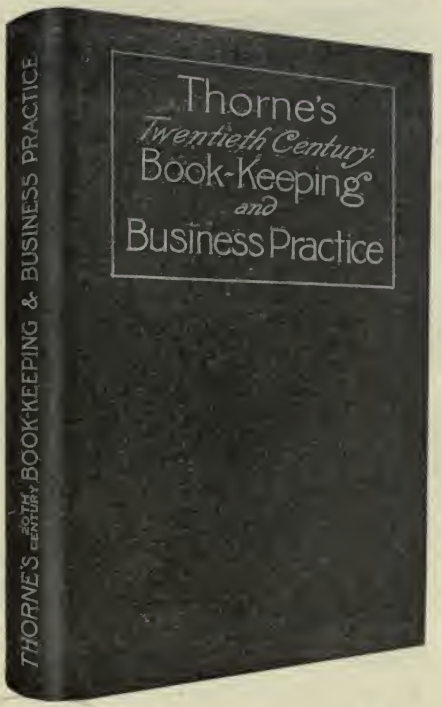


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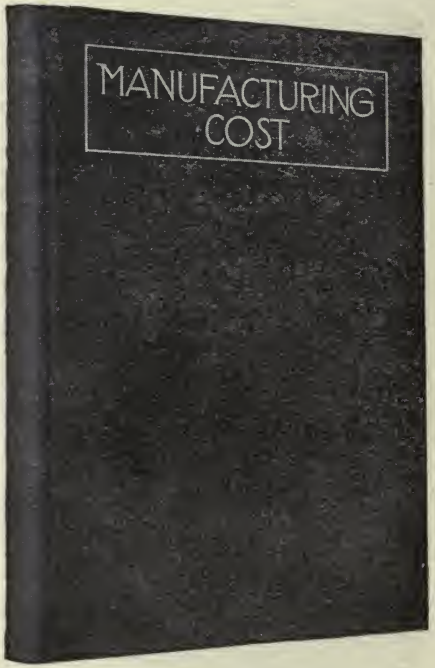


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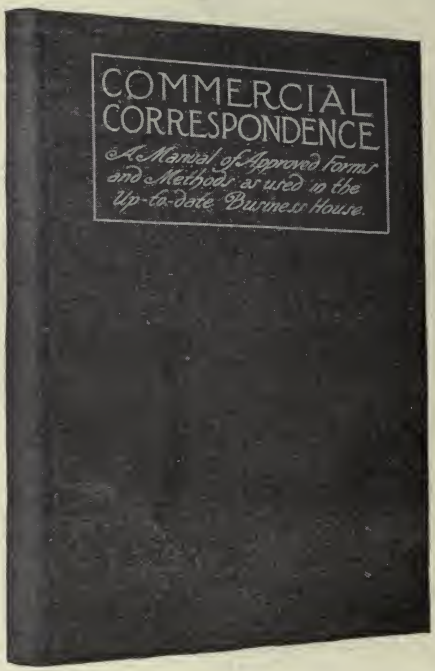


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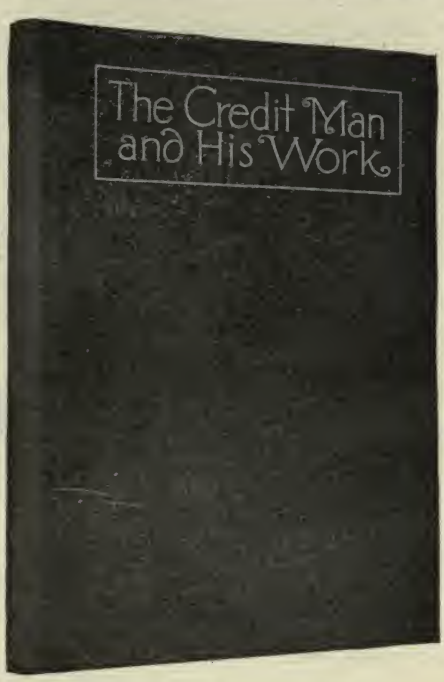


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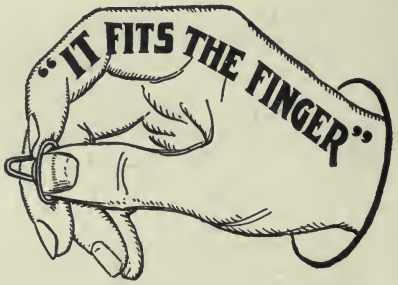


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